October 5, 2017

UNITED STATES OF AMERICA
ENVIRONMENT PROTECTION AGENCY

PUBLIC HEARING

PROPOSED ORDERS

SDWA 06-1017-1110
SDWA 06-1017-1111
SDWA 06-1017-1112

Tulsa County Courthouse
Room 119
500 South Denver Avenue
Tulsa, Oklahoma 74103-3844

Wednesday, October 11, 2017

The above-entitled matter came on for hearing at 9:14 a.m.

BEFORE:

TOM RUCKI, Hearing Officer, EPA

October 5, 2017

APPEARANCES:

ELLEN CHANG-VAUGHAN, Attorney
KRISTEN TALBOT, Attorney
U.S. EPA Region VI
Office of General Counsel
1445 Ross Avenue, Suite 1200
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FOR THE ENVIRONMENTAL PROTECTION AGENCY

ALSO PRESENT:

Robert Winter, Jireh Resources
David House, Jireh Resources
Lanny Woods, Jireh Resources

Steve McNamara, Warren American Oil Company
Doug Norton, Warren American Oil Company

John Tucker, Novy Oil & Gas

I N D E X

EXHIBITS

EPA DOCUMENTS

WARREN AMERICAN

NOVY OIL & GAS

P R O C E E D I N G S

[9:14 a.m.]

HEARING OFFICER RUCKI: I'm going to officially put us on the record here. It's 9:14. I'm going to start a minute early.

We're here today -- my name is Tom Rucki, the Regional Judicial Officer for Dallas EPA Region 6.

But today I'm acting as just a Hearing Officer. This is a public hearing. We won't be conducting a trial. We won't be conducting cross-examination.

This is regarding SDWA 06-2017-1110, 1111 and 1112. We're going to have Jireh -- and I apologize if I'm saying that incorrectly. Jireh Resources, Warren American Oil Company and Novy Oil and Gas. And when those parties are finished, we'll be having the public commenters.

It's my understanding that things may not go as long as we expect them to go. As we discussed earlier through emails, if things finish early, the other parties are welcome to start as soon as they're ready.

With that, Jireh, you can begin.

And I'm sorry, would you please spell

your name for the record, everyone, as you come up.

PRESENTATION OF JIREH RESOURCES

MR. WINTER: Yes, sir. My name is Robert Winter, W-I-N-T-E-R.

Good morning, Hearing Officer Rucki. As I say, my name is Robert Winter. I represent Jireh, J-I-R-E-H, Resources, LLC, in the matter of your Docket No. SDWA 06-2017-1110, which involves Jireh well numbers 9, 4W and 18W in Osage County, Oklahoma.

I'm here today with Dave House, who is Jireh's president of operations, and Lanny Woods, who is Jireh's vice president of operations.

Mr. House will address Jireh's general corporate operations. Mr. Woods will address the operations in the field specifically.

For my part, I just would like to provide a few points of context for Jireh's presentation today.

I don't know, first of all, Mr. Rucki, whether you've been to this tributary on the North Fork of Bird Creek.

HEARING OFFICER RUCKI: I have not.

MR. WINTER: It's a beautiful area. It's marked by rolling hills. It's a wide prairie

landscape covered with native bluestem type grasses common to Osage County.

The area provides sustenance and forage for cattle, horse operations and ranching operations in general, and it's been an active area for oil and gas production for probably something like nearly a hundred years. Jireh has been operating in this rustic rural setting for probably -- since the late 1980s.

The tributary at issue is probably fairly described as an intermittent stream. In wet weather it carries water.

In dry times, because of its shallow nature, the water tends to pool at areas along the creek. These individualized pools move along the creek bed.

The actual impact site that we're addressing today has been characterized as a 1- to 1.5-mile area along this tributary of the North Fork of Bird Creek.

More recently, I've seen descriptions of the actual impact area being described as two pools, which are next to a culvert grid.

More generally speaking, the area is 15 miles upstream and northwest of Pawhuska, which

is the county seat of Osage County, home to about 3500 people.

From where we're sitting today, Pawhuska is probably about an hour-and-10-minute drive northwest of Tulsa.

Specific to Jireh, Jireh's oil and gas works at issue involve producing fluids in the formation known as the Mississippian Chat, which is located at a subsurface depth of about 2800 feet.

Jireh's production from the Mississippi Chat is saltwater and oil. Once the fluid comes to the surface, the oil is removed. The oil is processed. The oil is sent to market.

The saltwater that is brought to the surface with the oil is returned to the Mississippian Chat formation.

No other water, no outside water is added to the separated saltwater that is returned to the Mississippian Chat.

So in essence, once the water is removed, the oil is extracted and the water is returned, and that is their process.

In the time leading to the discovery of chlorides in this tributary, there were no visible surface indications of a spill event, much

less a connection specific to Jireh, whose operations are three-quarters of a mile, almost a mile away.

The tributary area at issue, the impacted tributary, is not within the scope of Jireh's oil and gas lease.

We understand that the spill was discovered in early August of 2016. Jireh was notified several weeks later in the closing days of August of 2016.

Since that time, Jireh, Lanny and David, have worked with the Environmental Protection Agency, the EPA, to try to understand the dynamics of the situation.

David and Lanny have gone to Dallas to meet with EPA officials. They have met on the site. They've walked the land with EPA officials.

They've gone to Pawhuska and met with representatives of the Bureau of Indian Affairs and the tribe to provide insight into the problem.

I think it was Lanny that delivered a four-inch notebook of Jireh's operations and production records to the EPA voluntarily.

We still at this point don't understand all of the EPA's theories based on the

data, probably because we just received several thousands of pages of documents last week, and we anticipate, we understand that several thousand more are coming.

So we are working with the information we have based on their year-long investigation, which we haven't had a chance to truly digest and appreciate.

Based on what the EPA has provided us though so far, we understand a few salient points. Number one, the water quality testing for chlorides near Pawhuska and the water wells located on the ranch have all returned with negative results, which is a good thing.

Further, the test results from the two pools, as we understand it, the chlorides -- where the chlorides were originally found, those chloride numbers have been decreasing over time, which is also a good thing.

There's simply no question this is an unfortunate situation. It has been a challenge to everyone involved, and Jireh certainly has no animosity towards the EPA or anyone else who's been harmed or impacted by this.

Based on the information that we have

and what we've seen so far, any notion that there is a continuing or ongoing spill is simply not supported by the facts.

Further, we don't see, based on the facts that we've received from the EPA and the information that we have in any way Jireh's operations have caused the spill of the chlorides into the tributary.

And finally, as far as Jireh's processes, from the information we have, there's no connection between Jireh taking water out of the Mississippian Chat and returning water to the Mississippian Chat, that the pressures and processes involved in that have caused any chlorides to seep into the tributary.

Now, later on today you're probably going to hear from some other folks who may not be so closely familiar with Jireh's operations, about what they think that might have caused or may be causing problems in that tributary.

It is understandably an incredibly frustrating situation, frankly, and no doubt an emotional matter too, because it involves the environment that we all care about.

However, from what we have seen, the

allegations that have been made against Jireh generally fall into a couple of categories.

Number one, the allegations generally just aren't supported by the facts of the operations, as we have indicated.

Number two, much of what is said appears to be based on assumptions, which have been layered on other assumptions, some of which just aren't accurate.

And number three, there seems to be a misunderstanding of information, whether it's interpretation that's wrong is a fundamental misunderstanding, which leads to, frankly, inaccuracies.

We see a reasoned result that is based on probabilities and not possibilities and that is anchored in truth and not speculation, anchored in logic and not speculation.

Ultimately, we hope that Jireh is not judged prematurely, that we have adequate time to look at the underlying information that EPA has gathered during its year-long investigation.

We hope that we can receive a reasonably fair hearing where we get to present our side, the information that we've gathered and

evaluate what the EPA has said and not just have this be a one-sided narrative.

And frankly, we have had and expect to continue to have a pleasant, professional and productive relationship with the EPA to get to the bottom of all this.

Perhaps most of all, we look forward to getting to the truth of the matter, which is something that we don't think has yet been shown.

So in the meantime as we work to better understand this information we've received, to digest the information that we are getting, that's still to come, please let the record reflect that Jireh respectfully opposes and objects to the proposed administrative order issued by the Environmental Protection Agency in this matter relative to Wells No. 9 and 4W and 18W.

I will now introduce to you David House, who is Jireh's president. He will be followed with short comments by Lanny Woods.

We appreciate your time and the opportunity. Thank you.

HEARING OFFICER RUCKI: Thank you.

MR. HOUSE: Good morning.

HEARING OFFICER RUCKI: Good morning.

MR. HOUSE: My name is David House, H-O-U-S-E. Thank you for the opportunity to visit with you today regarding the proposed administrative orders that are the subject of this hearing.

I'd like to just begin by introducing you to Jireh Resources. We're a very small oil production company. We own 11 leases in total. All of them are in Osage County.

My business partner, Lanny Woods, is a geologist and we each have over 35 years experience in the oil and gas production business.

About eight years ago we raised some equity money from some local businessmen. We put in the majority of our own personal net worth and we bought these properties.

We bought these properties with the intention of being long-time owners and we still have that intention today.

The two leases that are the topic of these proposed administrative orders represent 60 percent of the value of our company.

We have five employees and one contract person on our payroll and we've called Pawhuska the home of our company since the

beginning about eight years ago.

The purpose of this introduction is to make it clear that this is a critical issue to us. Everyone involved, our employees, our lenders, our investors, our vendors, our customers, all have a vested interest in discovering the true source of this contamination through our combined investigation with the Environmental Protection Agency, the Bureau of Indian Affairs, the landowners and our fellow producers in the area.

I'm deeply committed to solving this mystery, because it's impacting the environment in the vicinity of our operations.

Whether deserved or not, this casts a shadow on the reputation of Jireh and, frankly, threatens the future of our company. It can also possibly result in the loss of valuable oil reserves to the Osage Nation.

An important point is that the data we have accumulated today tends to contradict the theories that are being discussed by the EPA and other parties and suggests a very different source of contamination altogether.

From the very beginning of Jireh, Lanny and I have dedicated ourselves and our

employees to operate Jireh in a manner that we would want to be treated.

We have done our best to treat all stakeholders, whether investors, regulators, employees, vendors, we treat them the way we want to be treated.

We do the same with surface owners also. We treat them the way we want to be treated.

Frankly, the previous operator left some of these leases in rather poor conditions and we have spent a substantial amount of time and money bringing this surface facility up to what we would consider approved standards and in compliance with all the applicable EPA, BIA and other regulatory rules and regulations.

We're not perfect. We make mistakes. But when we make one, we notify the applicable regulatory agency, we notify the surface owner, and we fix the problem.

When we have had a notice come from a regulatory agency that we've had a problem, we expeditiously and professionally repair whatever that problem is. This is just the way we do business.

Let me also say that we're outdoor

enthusiasts also and we're surface owners. We fish, hunt, hike, camp, and we want to do this activity in the cleanest and most pristine environment the same as every other Oklahoman.

We strive on a daily basis to operate our properties in a way that is conducive to these activities and protective of the environment around us.

Speaking to the specifics of this particular matter, the intermittent stream that is the subject of this hearing is not on our lease.

If it had been on our lease, we would have taken care of this problem when it first appeared a year ago.

The methodology to arrest saltwater spills and correct problems is well established in Osage County.

You go below the existing contaminated area, build a temporary dam, bring in vac trucks and literally vacuum the water out of the creek.

If necessary, you actually remove the stream bed if it's been contaminated also, flush the area with fresh water and then continue monitoring it to be sure that no incremental remediation is required.

If this had been done a year ago, over a year ago now, we probably wouldn't be here today. This would be an incident long forgotten.

We have actually discussed this process with our joint operator, Warren American, and with EPA.

Both are in favor of following this action even still today. We hope to reach an agreement still with the landowner that will allow us to remove the remaining contaminated water.

As to determining, trying to determine the source of the spill, we have requested all the related data that EPA has relied upon to make their conclusions today.

As Robert said, we have received a fair amount of data and we expect to receive substantially more data from EPA, hopefully by the end of the month. That's what they're telling us now.

Based on an informal meeting with the EPA, they seem to believe that an underground saltwater plume from 2500-feet deep -- 2500 feet, that's like a 250-story office building -- was driven by some mysterious high pressure up out of the reservoir 2500 feet over a big hill from our

lease, down a hill and popped out from the bottom of an intermittent stream.

Understand, there was never any evidence of any saltwater flowing from the surface. This all supposedly happened underneath the ground.

We believe this conclusion is based on assumptions that are not supported by actual data or the law of physics.

We have seen no downhole pressure readings reported by the EPA. We may get some in the future. We don't know.

But downhole pressure is the key element in understanding the theory. There has to be enough downhole pressure to drive this plume of saltwater up, over, around, back up.

As part of normal operations, we routinely test bottom hole pressures. We have never seen any bottom hole pressure that was anywhere close to allowing this type of plume to transfer to that 2500 feet of surface, three-quarters mile away. We just haven't seen it.

Despite our data, we now face a proposed administrative order that does not appear to be supported by facts or science, but could potentially financially ruin our company and eight

years of effort.

What we've elected to do is to the very best of our ability cooperate with EPA and BIA in this investigation.

We have gone out and retained Ph.D., petroleum reservoir engineers, who are looking at our data, looking at EPA's data and will continue to look at EPA's data.

We've hired Ph.D. hydrologists who are doing the same thing. And yes, we even had to hire some attorneys to help us in this.

But our goal is for EPA and the public to understand that we're working toward a true solution and we want to get to the bottom of this.

From here forward, we look forward to receiving the incremental data from EPA, have our consultants review it, and through further discussions with EPA and the BIA if appropriate, we will demonstrate with bottom hole pressure tests, hydrology studies and expert testimony regarding reservoir engineering, production records and geologic data that it's physically impossible for our wells to be the source or the cause of the saltwater that was discovered a year ago.

Our goal today is simply to state for

the record we're confident that our company and its wells had nothing to do with saltwater that was found in the intermittent stream that's a tributary to North Bird Creek.

Our preliminary data supports this conclusion with scientific fact. We certainly have not pumped or dumped water into this small stream.

We look forward to resolving this issue in a manner that benefits all concerned. We want to protect the beautiful environment of Osage County. We love that area of the state and we are going to get to the bottom of this.

Thank you very much for your time.

HEARING OFFICER RUCKI: Thank you.

MR. HOUSE: I'll turn it over to Mr. Lanny Woods.

MR. WOODS: My name is Lanny Woods, L-A-N-N-Y, W-O-O-D-S. Thank you for this opportunity to discuss the situation at North Bird Creek and what Jireh Resources believes may have happened to cause the saltwater spill.

As my partner, David, alluded to, I am a geologist and we are trained for situations such as this.

We are trained to test, to analyze

circumstances, and to offer possible science-based explanations for what's happened.

To give some brief background, Jireh Resources was first contacted about this incident two days prior to August 31st, 2016.

As has been previously mentioned, the spill was not on our lease and it was more than a mile from the closest well.

At this meeting, we met with other operators in the general area to discuss the apparent saltwater spill that had been discovered in a small intermittent stream south of Jireh's operations.

At this first meeting we discovered that saltwater with chlorides of over 8,000 parts per million were found in a pool on the downslope side of an intermittent stream and directly adjacent to a culvert bridge.

The water on the upslope side of the bridge was fresh. So the only place the saltwater was found in the creek was on the downslope side.

We were told that the Bureau of Indian Affairs and EPA ran an extensive search in the entire area looking for any indication as to where saltwater may have come from.

Any saltwater spilled on the surface would kill vegetation, making it easier to locate any kind of spill site. We were told that no signs of a surface spill were found.

So I believe the question that was and is still in everyone's minds is where did the saltwater come from to get into the creek, and in particular the small pool just below the bridge.

Early on it was suggested that saltwater may have been illegally dumped into the creek on the downslope side of this culvert bridge that spans the creek.

This would easily explain why saltwater was not found anywhere else in the immediate area and why it was only found on the downslope side of the bridge.

The EPA's own internal report suggests the same possible conclusion. Its August 16, 2016, inspection report states, "Flow paths, seepage and other potential surface indications were not observed."

Later on it says, "Another possible source of the wastewater could be a possible dumping from a tank truck from the county road."

The current data that we have still

indicates that this is what likely caused the original saltwater spill.

So what is the EPA's current theory as to how the saltwater got into the creek? Based on the data accumulated to date -- and understand that data collection is still going on, EPA personnel apparently believe that the injection wells used by the area operators had supercharged or overpressured the zone they recycle water into, the Mississippi Chat Reservoir, and that this has caused saltwater from the zone to travel some 2500 feet up through some unknown pathway or from an improperly plugged well, and then directly into the creek. The odds that this scenario caused the spill are extremely low.

Let's talk about the pressure issue. Recall the EPA's theory is based on the assumption that we had overpressured the reservoir. The facts do not support this theory.

The volume of oil that has been produced from the reservoir underlying the lease exceeds 4.8 million barrels of oil and represents about 35 percent of the original oil in place.

Since 1988, over 1.1 million barrels of oil, which is equivalent to 45 million gallons

of oil, have been taken out of the reservoir. This has caused a huge reduction in the fluid volume and pressure.

Since 1988 no makeup water has been put into the reservoir, meaning no water other than the water that has been produced from the reservoir is being put back into the reservoir.

No additional water has been put into the reservoir to make up for the oil that's been produced and taken out.

This is basically a recycling operation. For each barrel of oil and produced water that comes out of the reservoir, the oil is separated and the water is simply returned to the reservoir from which it came.

So more fluid is being taken out than what's being put back in. This condition cannot cause a reservoir to become overpressured or supercharged.

It can only reduce the volumes and the pressures within the reservoir, and we have solid data that support this fact.

Jireh Resources have spent the time and money to properly test for actual bottom hole pressures. These show to a degree of certainty

that the reservoir is depleted and not overly pressurized.

A respected petroleum engineer, who is a professor at the University of Tulsa, has reviewed the available data and made the conclusion the Mississippi Chat Reservoir in the Jireh release area cannot support overpressurization.

There is no unusual synergies between wells that would support supercharging of the reservoir.

Just as an example, Jireh's 18W well, we recycle about 2800 barrels of water per day with a surface pressure of less than 200 psi. PSI is pounds per square inch.

When the pump that recycles the water into the well shuts off, the pressure at the well goes to zero psi instantaneously. Zero psi means there is no pressure.

The EPA has indicated it believes the saltwater is still entering the creek, and we do not believe this.

The first report of the incident at the creek indicated that saltwater content in the first creek pool below the bridge was 80,000 parts per million.

Since that original reading, the parts per million has generally proceeded to go down every month, and there has been no recording near the original 80,000 parts per million.

In late May 2017 the EPA installed ten monitoring stations in various parts of the creek. Since May 28, 2017, the station near the original spill site, the one in the upper pool, measured 500 parts per million, which is basically fresh water. The pool remains clean today.

Sometime after the first reported spill site was identified, a second pool was found about a half mile south and downstream.

This spot had a reported saltwater content around 45,000 parts per million. It, too, has slowly started to clean up.

This data supports one of EPA's initial potential causes, that saltwater was illegally dumped into this stream and over time the saltwater in these pools have slowly been diluted and reduced as rainwater washes through the small portion of the stream.

Other than for a brief shut-in for testing, Jireh has not shut down its operations and has continued to produce oil and recycle produced

water back into the reservoir just as it did before the spill.

No increase in saltwater has been reported at the original pool. As a result and contrary to what EPA has indicated, we do not see any correlation between our recycling operations and in-steam water quality. We continue to operate and the stream is getting cleaner.

So based on this data, whatever happened in the fall of last year is no longer happening.

In conclusion, we at Jireh Resources have been and will continue to be committed to doing our very best in keeping our leases and surface areas free of environmental problems.

We have worked with EPA, giving them any and all they have requested in a timely manner and we'll continue to do so.

The incident which contaminated a small portion of North Bird Creek Tributary is certainly an unfortunate situation, but the data being generated from the site indicated that Jireh's operations are not to blame for this problem.

Nevertheless, as a concerned citizen

of Osage County, we want to be committed and try to find good results to this problem.

We have additional data analysis by our consultants that we're going to share with EPA, which we believe is going to support our position.

We look forward to the satisfactory resolution to this incident and appreciate EPA's willingness to work with us in this mutual effort.

Thank you.

HEARING OFFICER RUCKI: Thank you.

MR. WINTER: Officer Rucki, there's no more commentator with presentation on behalf of Jireh.

HEARING OFFICER RUCKI: Great, thank you. Thank you both also.

Warren American, if you'd like a few minutes, you can have those, or we could just go right into your presentation. It's up to you.

MR. McNAMARA: Your Honor, Steve McNamara for Warran American. If we could possibly have ten minutes?

HEARING OFFICER RUCKI: Sure, that's great. We'll start again at 9:56.

[Recess.]

PRESENTATION OF WARREN AMERICAN OIL COMPANY

MR. McNAMARA: Mr. Rucki, my name is Steve McNamara. I'm an attorney here today on behalf of Warren American Oil Company. My name is spelled M-c-N-A-M-A-R-A.

And I'm not going to make any substantive comments other than we had prepared written reports that we would like to be included in the record. These would include the opening statement of Mr. Doug Norton, who I'll introduce in a moment.

We have a reservoir engineering study that's been prepared by William M. Cobb & Associates out of Texas, one of the recognized petroleum engineering firms.

We also have the affidavit of Mr. John Burroughs, who's the Vice President of Operations for Warren American, and he's here today.

And we have a report by Dr. Kerry Sublette, who is the Sarkeys professor of environmental engineering at the University of Tulsa and is well respected.

And I've marked these as Warren American Exhibits 1, 2, 3 and 4, and so that the record is complete, that we have -- we make sure

that these engineering and scientific studies and the data and conclusions that they come to are properly before the Environmental Protection Agency when it makes its decision to change these proposed orders into final orders, that they have this in the record.

HEARING OFFICER RUCKI: Great. Thank you.

[Warren American Exhibit Nos. 1 - 4 were received.]

MR. McNAMARA: So if I may approach?

HEARING OFFICER RUCKI: Yeah, please.

MR. McNAMARA: In keeping with the spirit of this hearing as open to the public, we've decided that lawyers -- lawyers making arguments is not conducive to the free flow of information. And so I wanted to introduce my clients.

Mr. Doug Norton is the Chief Operating Officer. Mr. John Burroughs is the Vice President of Operations. We also have Mr. Tom Turmelle, who's the Vice President of Geology for Warren American.

It is a small company, and what we are talking about today is probably seventy percent of the management skill of the company that's here

today.

And I want to state for the record that since first being notified of this problem, Warren American and these three individuals have devoted hundreds of man hours of their time to try to determine what is the cause of this incident and how -- how Warren American's operation could have been involved in this.

They firmly believe -- and I believe the facts and evidence will show -- that it is not Warren American's operations in any way, shape or form that contributed or caused this spill.

So we have, for the record, complied with every request -- not order, every request -- that the Environmental Protection Agency has made of Warren American.

It has voluntarily complied with -- it has shut down its production of -- and so the record is clear, when one shuts in their disposal wells, we cannot produce oil, because, as the other speakers have said, in a recycling operation, if you keep producing fluid and you don't have a place to put the water, then it doesn't work. So you have to shut-in the producing wells in order to shut-in the disposal wells.

And we've shut-in the disposal wells and therefore shut-in our entire operation on this lease for a short period of time at the request of the EPA when they requested all operators to shut-in.

And then subsequently we shut-in ours for an extended period of time, approximately 30 days, and then recently we've reactivated our lease, in part, because we have an obligation under the law to the Environmental -- to the Bureau of Indian Affairs and the Osage Nation to produce the lease. And we reactivated them to save the lease, but we also reactivated them because our experts felt that we needed more data and more information.

I would like to concur that the overarching question here is whether this is a recurring event, and Warren American very much wants permission to vacuum the polluted water out of the creek and return it as close as possible to a pristine condition, and then to continue to observe if additional saltwater comes back into the creek and, if so, from where.

So with that, I'd like to introduce Mr. Doug Norton. He's going to be reading his prepared statement, which is Exhibit 1.

HEARING OFFICER RUCKI: Okay. Thank you.

OPENING STATEMENT OF WARREN AMERICAN OIL COMPANY

MR. NORTON: Officer Rucki, my name is Doug Norton.

HEARING OFFICER RUCKI: Good morning.

MR. NORTON: I'm speaking today on behalf of Warren American Oil Company concerning the Bird Creek salinity issues being investigated by the EPA.

Warren American is grateful to the EPA for the opportunity to place into the record written expert reports and evidence which we believe conclusively exonerates Warren American from the allegations that it has failed to confine injected fluids to the authorized injection zone, resulting in a contamination of Bird Creek.

Warren American has been in business for over 75 years, and enjoys an excellent reputation, both inside and outside the oil and gas community.

This is the first time in Warren American's history where it has been involved in an EPA hearing. Warren American is deeply committed to protecting the environment of the Osage County

while producing oil and gas for our own benefit and for the benefit of the Osage Nation.

Warren American has owned the Chapman lease since December 13, 2013, when it was acquired from Link Oil Company.

Warren American has fully cooperated with the EPA in every aspect of this investigation since August 2016 until the present date. We have turned over to the EPA all of our files and records pertaining to our injection wells and our production wells.

We have devoted hundreds of man hours internally investigating our own operations in an attempt to arrive at an answer to this dilemma.

We have periodically shut down our operations, conducted numerous diagnostic tests on injection wells and producers, and monitored salinity and temperatures at various spots along Bird Creek over time.

We have spent numerous hours discussing both facts and theories with the representatives of the EPA and representatives of the surface owners.

We deeply value the input and efforts of the general public and the EPA that have been

made with respect to this problem, and pledge to continue to work with the Agency and surface owners in the future.

Now, with respect to the proposed order that was sent to Warren American by the EPA on July 29, 2017, it is Warren American's opinion that the conclusions reached in the proposed order as to Warren American's operations are factually and scientifically incorrect, and the data does not support the EPA's theory that the Mississippi Chat formation is over-pressured.

Warren American's opinion is based on the following observations:

1. The Mississippi Chat formation is not over-pressured. As a preliminary matter, we would note that, of the three injection wells operated on the Warren American -- on the Chapman lease, two of the wells, the B8 and B9, are taking water from a vacuum, and the third is operating at a very low injection pressure.

It is difficult to understand how the EPA could arrive at the conclusion that the injection wells that take water on a vacuum could leak to or contribute to the over-pressuring at the Mississippi Chat formation.

In the aggregate, Warren American's producing operations bring both water and oil to the surface, separates the oil from the water, and then reinjects the water into the same producing formation without adding any makeup water to replace the oil volumes produced.

This concept, or recycling operation, has been going with respect to the Mississippi Chat Reservoir at this location for more than 50 years. The result is that the reservoir pressure in this Mississippi Chat formation is now less than the bottom hole pressure was 50 years ago.

Since the pressure within the Mississippi Chat has continuously declined over time, there is no scientific or factual basis for the conclusion that the Mississippi Chat has been or is over-pressured.

As a professional registered petroleum engineer with 40 years of experience, I can attest that it would be classified as a normally pressured reservoir.

To study this finding of the EPA, Warren American has engaged the services of Cobb & Associates, petroleum engineers. Under Cobb's guidance, Warren American recently obtained

measured bottom hole injection pressures for all its injectors on the Chapman lease.

A copy of the Cobb & Associates report is submitted along with this statement, which concludes (a) the Mississippi Chat is not over-pressured; (b) that the Warren American injection wells are not injecting water in volumes or pressures anywhere close to the fractured gradient for the Mississippi Chat formation; and (c) that there is approximately 2,400 feet of vertical elevation between the top of the Mississippi Chat formation and the bottom of the Bird Creek at Monitoring Station No. 6; and finally (d) that 90 percent of the pressure drop from the injection wells to the producers occurs within 10 feet of the injectors, and therefore there is insufficient reservoir pressure, even while water injection is occurring, to lift a column of fluid from the Mississippi Chat into the bottom of Bird Creek. As long as the water is entering our injection wells at the surface and actually enters the Mississippi Chat formation, it does not channel up the back side of the casing.

Conclusion No. 2. Warren American's injection water is confined solely to the

Mississippi Chat formation.

Also submitted along with this statement is the affidavit from our Vice President of Operations, Mr. John Burroughs.

As Mr. Burroughs' affidavit describes, Warren American has taken additional steps to conclusively prove that the water it is injecting into the injection wells is not escaping somewhere between the surface and the Mississippi Chat formation.

This is evidenced primarily by three radioactive injection profile tests which Warren American recently caused to be run by Associated Wire Line Service of Healdton, Oklahoma.

These tests, the results of which are attached to Mr. Burroughs' affidavit, conclusively show that all water injected into the Warren American wells enters the Mississippi Chat formation, and does not escape between the surface and the Mississippi Chat or channel up the outside of the wellbores.

The Cobb report, referenced previously, also concludes, based on these injection profiles, that the injection water is confined solely to the Mississippi Chat formation.

3. Warren American injection wells have not recently failed MIT tests. There has been an insinuation that Warren American's injection wells have recently failed MIT tests. This was alluded to in the public comments.

Mr. Burroughs' affidavit corrects the record with respect to the facts. A summary of Mr. Burroughs' affidavit regarding these issues is as follows:

(a) Warren American's CW4 Well, sometimes referred as the "C1 Well," did fail an MIT test on November 18, 2014, at which time all injection of fluids was discontinued. The well was subsequently plugged in 2016, as witnessed by the EPA; and

(b) Warren American B9 Well failed an MIT on August 11, 2015. All injection was discontinued at that time.

As Mr. Burroughs' affidavit shows, efforts were made to repair the B9 Well, which were ultimately successful. Injection was recommenced after the well successfully passed an MIT test on December 30, 2016. The B9 Well is currently taking water on a vacuum and injecting approximately 900 barrels of water a day.

In summary, neither of these wells could have contributed to the pollution of Bird Creek, which occurred in August 2016, as neither had been in operation for a full year prior to the discovery at Monitoring Station No. 2. Also, neither had the type of failure that would permit injection into a shallow horizon.

Now, concurrent with our conclusion that Warren American is not responsible for the Bird Creek contamination, a separate likelihood has been determined: that the contamination was a one-time event and there is no ongoing pollution into the creek.

This topic is addressed in a second report offered by Dr. Kerry Sublette, distinguished professor of environmental engineering at the University of Tulsa. And in addition to studying the data provided by the EPA, Dr. Sublette walked the creek, and supervised the measuring of the salinity and temperature in several spots beyond the EPA signs over time.

Dr. Sublette's report is also being offered into the record today to support Warren American's observation that the salinity levels present in Bird Creek have declined over time and

are continuing to decline.

In particular, the salinity levels at Monitoring Station No. 2 where initial reports found 80,000 ppm of chlorides have now fallen to below 1,000 ppm and continue to decline.

Salinity also continues to fall at Monitoring Station No. 6, although the salinity measurements remain high in the deepest part of the pool there. However, the salinity reading is six inches from the surface at Station No. 6, but it increased rapidly to the 1,500 ppm range.

Dr. Sublette concludes that all observations of increased salinity can be explained by stratified flow and pool-to-pool transport of salts.

Another significant finding by Dr. Sublette is that the temperature anomalies observed at various depths of Bird Creek could readily be explained by solar heating of the dense saline layers. Therefore, communication with the creek and a deeper strata would not be necessary to explain elevated temperatures at deeper, high-salinity locations.

So that the record is clear, Warren American was requested to voluntarily shut-in all

three of its injection wells on at least two occasions.

The first time was from June 9 to June 16 in conjunction with the shut-in of all three of the operator's wells at the EPA's request.

The second shut-in began on August 9 to cooperate with EPA's proposed administrative order. From that date for approximately 30 days, Warren American's production facilities were completely shut down.

It should be noted for the record, Warren American has no alternative source to take produced water off of the Chapman lease. Also, Warren American has been told by EPA personnel that no new permits to drill a disposal well further to the north or to dispose of our produced water into different formations will be approved. Without disposal wells, Warren American cannot produce the Chapman lease.

As a consequence of the foregoing and in an effort to continue to gather scientific data, Warren American decided to reactivate its operations following the 30-day shut-in. The reactivation occurred on September 8, 2017.

From that date, Warren American has

obtained readings from both Monitoring Station No. 2 and Monitoring Station No. 6, with the consent of the surface owner and the knowledge of the EPA. Dr. Sublette addresses those readings in his report.

The bottom line is that the salinity levels continue to decline and remain steady, even after Warren American's wells had been reactivated. This certainly suggests that Warren American wells have not, and do not, contribute to the saltwater that entered Bird Creek in August 2016, nor does it appear that there is any current inflow of saltwater from any source.

In conclusion, it is Warren American's position that, at all times, we operated wells in compliance within terms of our underlying permits. We believe that the initial photographic evidence of oil and oil sheens in the creek in August 2016 and the absence of any reported oil sheens subsequent to August 2016 strongly substantiate that this was a one-time event. The gradual decline of the salinity of the water remaining in the creek also supports our conclusion that the pollution is not currently recurring.

This is particularly true with respect

to Warren American's wells which were voluntarily shut-in for an extended period of time. The evidence shows that prior to the Warren American shut-in, during the shut-in, and after the injection activities were resumed, salinities within Bird Creek all continue a gradual, steady decline.

Warren American concurs with the recommendation in Dr. Sublette's report that the high-salinity water in Monitoring Station No. 6 be drained two or three times, if necessary. The salinity at that station should continue to be monitored during this process.

Further, Warren American believes that the EPA's proposed order to permanently discontinue disposing of produced water into the Mississippi Chat is arbitrary and capricious and is not supported by the data. As noted above, such an order would likely lead to the inability to produce the Chapman lease.

Other alternatives are available, at least on an interim basis, to monitor the situation. These would include (1) lowering the allowed maximum injection pressure on the Warren American injection wells; (2) requiring an annual

or biannual MIT test on the Warren American injection wells; (3) conducting weekly monitoring and reporting of casing pressure in addition to the current tubing pressure; and (4) requiring weekly monitoring of the salinity levels within Bird Creek for an extended period of time.

Warren American has not yet received all of the documents that it has requested from the EPA through various Freedom of Information Act requests. We respectfully request that we be provided adequate time to review and respond to this information once it is received.

Warren American is of the firm belief that its activities were not the cause of the observed pollution. Our expert reports show that the proposed order, as directed to Warren American, is not supported by scientific evidence, and represents a finding of guilt-by-association that is not warranted.

We honor our reputation for honesty and integrity in all matters pertaining to our operations, and the proposed order deprives us of the ability to prove our innocence.

We strongly urge the EPA not to go forward with the proposed administrative order

while data is indicating that no further contamination is occurring.

Thank you.

MR. McNAMARA: I believe that concludes the comments for Warren American. So we don't have any further testimony or evidence at this time.

HEARING OFFICER RUCKI: Great. Thank you. If Novy Oil is ready, we can continue. We're well ahead of schedule.

MR. TUCKER: Can we have just a couple of minutes?

HEARING OFFICER RUCKI: Sure, of course. Yeah, we can take another 10 minutes, if you like, and reconvene around 10:30.

MR. TUCKER: Sure.

HEARING OFFICER RUCKI: Thank you.

[Recess.]

PRESENTATION OF NOVY OIL AND GAS, INC.

MR. TUCKER: Good morning, sir.

HEARING OFFICER RUCKI: Good morning.

MR. TUCKER: You and I met before this --

HEARING OFFICER RUCKI: Yes.

MR. TUCKER: -- started here.

My name is John Tucker, T-U-C-K-E-R. And I told you that I'm probably the only person who showed up in a bow tie, and I guess that proved true.

I'm here on behalf of Novy, and present with me are Mr. Novy, which is logical because that's the name of the company, Mr. Johnson and Mr. Ellis, who are here representing the operator, which is Gray Horse Operating, and we do appreciate the opportunity to be heard and appreciate the courtesy shown to us by the folks at the EPA when our folks went to Dallas to visit with them. If asked they would tell you that our folks just went down and visited with them. We didn't present this as any kind of legal matter. I wasn't there.

We think probably it's because -- and this is what I want to try to explain today -- we really kind of don't belong in this situation for a couple of reasons.

One, which I'll demonstrate in a little bit is that it's pretty much scientifically impossible for the Novy B15 well to be a contributing cause to the surface water contamination discovered at what's been identified

as Station No. 2.

And the other reason is as a matter of public notice and as a matter of information which was communicated to the EPA earlier today, the relief that's sought by the EPA here, some action with regard to the continuing operations of the wells for the Respondents that are identified and have spoken here today.

We have received approval from the BIA to plug and abandon the well, which is the subject of this proceeding. We have an alternative means for our disposal, so our operation will not be affected by plugging and abandoning that well.

It's a luxury to have an extra disposal well, but wells are expensive to maintain. And since it's not something that's required for us, rather than be any kind of an issue, we're just wanting to plug and abandon. We're in the 30-day comment period now that follows the issue of the permit to plug and abandon.

But we want to present our position today as to why we cannot be a part of this. It's actually because, as of now, we're still a part of the EPA's contention that we are a participating or contributing factor.

As others have said, we, too, have submitted a FOIA request to the EPA and received a lot of data. We also received a letter from the EPA saying that it would require -- that the EPA would require an extended periods of time in order to comply with our brief request. And no exact date was given for the completion of the production.

We're not presenting expert testimony or reports today because, again, we want to see what the final product is of the Freedom of Information Act that would include all the things that were done by the Environmental Protection Agency.

So we do reserve the right, as we discussed prior to this hearing in correspondence, to submit further information, data, and opinions following receipt of the FOIA information.

And I think we're saying today is that the only reason that the Novy B-15 well is really here is because we're one of wells that was close to where the action was. That's what put us on the list. That's what aspect has to be evaluated.

The report of the EPA indicated that the testing that began in October 2016 and

continued periodically into 2017, elevated TES levels were reported, what's been described as the pool, as the pool by the culvert at Station 2.

Other wells were also -- or, other locations were also tested, but that's kind of the location that they key on.

And I would like to note, just for the record, one factual error in the interim final Bird Creek investigation and injection well response plan. I mention this and I think it's important because in the presentation of Jireh mention was made of access to the country road and that it was posited by -- posited by the EPA and also by Jireh that an outside person had actually dumped salt water at this location because the fresh water above the culvert and above the road and salt water in the pool which is Station 2.

And while the EPA did consider that to be in their final report, as I read it, in the section on page 5 that says "relevant efforts to date have determined", it notes that the site is remote with limited to access through locked gates and there have been no reported observance of illegal dumping there -- or, disposal activities. They conclude that this eliminates a service source

due to recent dumping.

It's important for the record to note that the locked gate, which is described by the EPA that prevented access was not installed until after the testing was complete in this project. That is to say that the landowners at that location determined that too many people were using their road and installed a gate and put locks on it. But that was after the event was discovered. It was not at a time prior to that.

So as far as opportunity is concerned, opportunity should be restored to the mix because there was certainly access.

There are few reasons that we know that it's impossible for the Novy well to have contributed to cause these high samples. The first thing that I'd like to offer, Exhibit No. 1, if I may for the record.

Do I hand this to you, Madam Reporter?

THE REPORTER: Yes.

[Novy Oil and Gas Exhibit No. 1 was offered into the record.]

MR. TUCKER: In Exhibit No. 1, and of course since this is a public hearing, I brought -- probably not big enough to see, but maybe it will

work. I brought a copy to hold up while I talk so the folks can see what we have here.

As you can note from looking at the exhibit, and I didn't put a little orange flag on yours, but you can see this location. This is the area in question. This is the Jireh well. Down here marked is the Novy well. This is Station 2 [indicating] where the pool is located. This is Station 6, although it's not really involved in our discussion.

And the thing that I'd like you to note out of this is a couple of things. This is topographic map. You know, topographic maps basically show elevations. This shows the elevation here [indicating], which is between the Novy well and Station 2, as being 1100 feet.

It shows it's still 1050 feet here [indicating]. It is 1100 feet here. The Novy well is a downslope of the 1100 feet. It is all downsloped into the nearest water stream, stream source, which is identified in the highlighted blue lines. This is an exhibit that was from the EPA's documents that we received in the FOIA request, which we have highlighted for clarity to show the surface flow of the streambeds and where they go.

A combination of the elevation and the location of the interdicting stream pretty well makes clear that it would be darn near impossible for anything from the Novy well to go upslope.

Also, it should be noted that is not noted in the reports, but in this general area, there are two water wells for domestic consumption that have been tested. The test results from those wells were not included in the matters in the FOIA production, but since they were tested that they'll be included in the matters yet to be produced.

Since those have been used continuously for household drinking water purposes without incident, we expect that the test reports will indicate that there's no particular salinity at that location.

Number two, these wells are all identified as injection wells, but technically that's not really correct. The Warren American well and the Jireh well used pressure pumps to inject the water that they're returning to the Mississippian formation. We're rewetting the aquifers as it's sometimes described.

That's not true of the Novy well. The Novy well does not even have, and has never had, a

pressure pump on premises. And yet, it's a very successful disposal well, which is what it is. It's not an injection well, but a water disposal well.

The reason that there is not a pressure pump on premises is the Novy well has always and consistently maintained a constant vacuum, a constant vacuum because this is a fluid-seeking formation. Now, our well goes to the Arbuckle and the Mississippian, but both, in a sense, are clearly fluid-seeking formations because no pressure is required to return water in formations from the Novy well.

And just -- not that this is any kind of a complicated issue to understand. Let me offer Exhibit 2 to my report.

[Novy Oil and Gas Exhibit No. 2 was offered into the record.]

MR. TUCKER: But by way of illustration, instead of a pressure gauge on the Novy well, there is a vacuum gauge to tell you how much vacuum is currently on the well.

Now, put that in scientific terms -- and I'm a lawyer, not a scientist -- but if you'll look at the reading on this gauge, which is -- oh,

I suppose this is 22, 24, 26, 28, it's about 29. That's 29 -- let me get this right. I want to say this right. This is a mercury gauge value of about 29.

So I used a standard conversion chart courtesy of Mr. Google, and in the standard conversion chart, that means that a mercury gauge value of 29.4 inches means that the psia, which is the pressure per square inch atmosphere is point -- is 0.39.

Now, we all learned in grade school or junior high that the atmospheric pressure where we're sitting right now is close enough to sea level to be about the same as absolute -- absolute pressure, which is 14.7 pounds per square inch.

Disposal water into this well is at a pressure that is a minus pounds per square inch relative to atmosphere. And in fact, if you take the absolute vacuum, .039 psia, that means that the equivalent in psia is minus 14.31 pounds per square inch.

Now, the interim report indicates, and I discussed the fact, that the EPA posits that disposal wells over pressured the Mississippian formation, thus forcing water out through spring

seeps or some other route, which apparently popped in the bottom of this pond number two under that theory. Which, in itself, is kind of a unique coincidence as it popped up no place else.

But the Novy well goes into a fluid-seeking formation.

The third point I'd like to make is that the EPA began sampling in 2016 and continued through 2017. The interim report notes that there was a mechanical integrity problem that was repaired during the study period for one of the other wells. And the EPA reports that after that well was repaired, surface water solids in Station 2 declined.

On May 9th of 2017 the Novy B15 well was shut in for operational reasons. Prior to that time, it was receiving water on a daily basis in normal operations throughout the sampling period, all the way up to May 9th of 2017.

Now, the EPA tests that continued after that date showed that surface levels of TPS at Station 2 continued to decline after the Novy well was shut in. EPA concluded that -- and the reason the EPA concluded that Novy should be here, and the only reason EPA concluded according to

their report that Novy should be here, is that TPS test results for Station 2 declined after the B15 was shut in. So by golly, it must have been a contributing cause. Novy was closed; levels continued to decline.

What the EPA did not consider, although they discussed rainfall, they did not consider the correlation of rainfall amounts to the decline of TPS -- of the TPS level reports.

Let me offer Exhibit 4 of the report, which are the Mesonet rainfall records.

[Novy Oil and Gas Exhibit No. 4 was offered into the record.]

MR. TUCKER: We know Mesonet is the official government recording group. Mesonet rainfall records for Foraker, Oklahoma, which is the closest recording station, and it's pretty close, from March 23rd, 2017, to August 1, 2017.

Then I want to offer Exhibit 3.

[Novy Oil and Gas Exhibit No. 3 was offered into the record.]

MR. TUCKER: Exhibit 3 is a chart that shows two things. I'm sure that nobody can see it past the first row. And I'm not even sure you can see it on the first row. But you can at least see

the two colors that we want to correlate here. The name of this is "Water Samples from Monitoring Station No. 2". This is from the EPA reporting documents. This is the date of the well repair. These orange lines are the -- are the reports of TPS for Station No. 2 for June of 2017.

You will note that from apparently -- approximately September of 2016 down to March of 2017, there is a rapid decline, and a significant decline depicted of the test results from No. 2. And it is significant to note that throughout this entire period of time that these levels are declining so rapidly, the Novy B15 well was operating at full speed.

It is difficult to say that the Novy B15 is contributing because this problem was a problem going away rapidly when Novy B15 continues to operate as usual.

Now, you'll recall, looking at this diagram again [indicating], you'll recall the EPA position is that Novy should be here because these numbers continue to decline.

And just for illustration, this is [indicating] approximately March of 2017. This is [indicating] April of 2017.

If you'll notice, the slope is exactly like that. If you'll notice the first three readings -- or, actually four readings that indicate a decline precede the date that the Novy well was shut in. And yes, readings did continue to decline.

But conversely, let's correlate this initial decline that began right here [indicating] in late March/early April with the continuing decline.

The blue line, which went this way [indicating], is the cumulative rainfall occurring during that period of time. And if you will note, there was a significant rainfall period there that occurred. And as we all know, rainfall flushes out the stream. It flushes out a pool particularly for an intermittent stream.

When you add in the fact that there is no scientific basis for a vacuum disposal well to be able to overpressure a formation, there's certainly no evidence as I can see -- or, as we can see, that the Novy B15 well could have contributed anything.

And it was noted, the latest samplings of the Station 2 indicate that the water is

suitable for consumption by livestock.

Having said all that and having explained why it is that we shouldn't be here in the first place, which I think we're here because of a misunderstanding of some of the physical facts.

Bottom line is, is this proceeding is, to us, should be considered moot because, at the end of our 30-day comment period, absent some change of view by the Bureau of Indian Affairs, this well will be permanently -- will be plugged and permanently abandoned.

Thank you, sir.

HEARING OFFICER RUCKI: Thank you.

Are there any of the public commenters here by chance?

Bill Biel or R.D. Farr, Ron Reed, Andrea Gleba, Joe Robert Serber, or someone from the Nature Conservancy, could be Michael Buor?

[No audible response.]

HEARING OFFICER RUCKI: No?

Well, I guess then at this point, we'll take a recess. And everybody who has said their information is certainly welcome to leave or stay. We're going to try to contact these

public commenters and see if they are coming to the actual hearing to give information or their comments.

So for now, we'll go off the record.

[Period off the record.]

HEARING OFFICER RUCKI: Good afternoon, everyone.

I'm going to go back on the record. It's now twelve o'clock.

Are there any public commenters here to offer any evidence or information or speak?

[No audible response.]

HEARING OFFICER RUCKI: No? All right. Well, we have -- we're going to give it till about one o'clock and if no one shows up between now and then to speak, we'll adjourn this hearing for the day and close the comments.

So until then, I guess we can go off record.

[Brief period off the record.]

HEARING OFFICER RUCKI: It's one o'clock. We're going to quickly go back on record here. It's my understanding that no one else is coming, or no one that we can reach is answering in the affirmative.

So, for the record, thank you.

[Whereupon, the hearing in the heretofore entitled matter was concluded.]

- - -

C E R T I F I C A T E

I, Ann Thornton Berry, hereby certify that this is the transcript of the proceedings before the Environmental Protection Agency on October 11, 2017, in the Hearing on Proposed Orders SDWA 06-2017-1110, SDWA 06-2017-1111 and SDWA 06-2017=1112, and that this is a full and correct transcript of the proceedings.

/s/ Ann Thornton Berry

ANN THORNTON BERRY, CSR #5767
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October 11, 2017
Hearing on Proposed Orders
SDWA 06-2017-1110, SDWA 06-2017-1111 and SDWA-06-2017-1112
Tulsa County Courthouse
Room 119
500 South Denver, Avenue
Tulsa, Oklahoma 74103-3844

9:15 – 10:45:	Jireh Resources, LLC
10:45 – 12:15:	Warren American Oil Company, LLC
12:15 – 1:15:	Lunch
1:15 – 2:45:	Novy Oil and Gas, Inc.
2:45 – 3:45:	Public comments

Proposed Hearing: SDWA 06-2017-1110, SDWA-06-2017-1111, and SDWA-06-2017-1112
October 11, 2017

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Proposed Hearing: SDWA 06-2017-1110, SDWA-06-2017-1111, and SDWA-06-2017-1112
October 11, 2017

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Proposed Hearing: SDWA 06-2017-1110, SDWA-06-2017-1111, and SDWA-06-2017-1112
October 11, 2017

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OPENING STATEMENT OF WARREN AMERICAN OIL COMPANY, LLC

EPA hearing, Wednesday, October 11, 2017

Gentlemen:

My name is Doug Norton, speaking today on behalf of Warren American Oil Company, LLC in Docket No. SDWA-06-2017-1111 concerning the Bird Creek salinity issues being investigated by the Environmental Protection Agency ("EPA"). Warren American is grateful to the EPA for this opportunity to place into the record written expert reports and evidence which we believe conclusively exonerates Warren American from the allegations that it has "failed to confine injected fluids to the authorized injection zone" resulting in the contamination observed in Bird Creek.

Warren American has been in business for over seventy-five (75) years and enjoys an excellent reputation both inside and outside of the oil and gas community. This is the first time in Warren American's history where it has been involved in an EPA Hearing. Warren American is deeply committed to protecting the environment of Osage County while producing oil and gas for our own benefit and for the benefit of the Osage Nation.

Warren American has owned the Chapman lease since December, 2013, when it was acquired from Link Oil Company. Warren American has fully cooperated with the EPA in every aspect of this investigation from August, 2016 until the present date. We have turned over to the EPA all of our files and records pertaining to our injection wells and our production wells. We have devoted hundreds of man hours, internally investigating our own operations, in an attempt to arrive at an answer to this dilemma. We have periodically shut down our operations, conducted numerous diagnostic tests on

injection wells and producers, and monitored salinity and temperatures at various spots along Bird Creek over time. We have spent numerous hours discussing both the facts and theories with representatives of the EPA and representatives of the surface owners. We deeply value the input and efforts that the general public and the EPA have made with respect to this problem and pledge to continue to work with the agency and surface owners in the future.

With respect to the proposed Order that was sent to Warren American by the EPA on July 29, 2017, it is Warren American's opinion that the conclusions reached in the proposed Order as to Warren American's operations are factually and scientifically incorrect, and the data does not support the EPA's theory that the Mississippi Chat formation is over-pressured.

Warren American's opinion is based on the following observations:

1. The Mississippi Chat formation is not over-pressured. As a preliminary matter, we would note that of the three (3) injection wells operated by Warren American on the Chapman Lease, two of the wells (B-8 and B-9) are taking water on a vacuum and the third is operating at a very low injection pressure. It is difficult to understand how the EPA could arrive at the conclusion that injection wells that take water on a vacuum could lead to, or contribute to, the over-pressuring of the Mississippi Chat formation. In the aggregate, Warren American's producing operations bring both water and oil to the surface, separates the oil from the water, and then reinjects the water back into the same producing formation without adding any "make-up" water to replace the oil volume produced. This concept (or recycling operation) has been going on with respect to the Mississippi Chat reservoir at this location for more than 50 years. The result is that the

reservoir pressure in this Mississippi Chat formation is now less than the bottom-hole pressure was 50 years ago. Since the pressure within the Mississippi Chat has continuously declined over time, there is no scientific or factual basis for the conclusion that the Mississippi Chat has been or is "over-pressured". As a professionally registered petroleum engineer with forty years of experience, I can attest that it would be classified as a normally pressured reservoir.

To study this finding of the EPA, Warren American has engaged the services of Cobb and Associates Petroleum Engineers. Under Cobb's guidance, Warren American recently obtained measured bottom-hole injection pressures for all three of its injectors on the Chapman lease. A copy of the Cobb and Associates report is submitted along with this statement which concludes (A) the Mississippi Chat is not over-pressured; (B) that the Warren American injection wells are not injecting water in volumes, or at pressures, anywhere close to the fracture gradient of the Mississippi Chat formation; and, (C) that there is approximately 2400 feet of vertical elevation between the top of the Mississippi Chat formation and the bottom of Bird Creek at Monitoring Station No. 6; and (D) that 90 percent of the pressure drop (from the injection wells to the producers) occurs within 10 feet of the injectors and therefore there is insufficient reservoir pressure (even while water injection is occurring) to lift a column of fluid from the Mississippi Chat into the bottom of Bird Creek (as long as the water entering our injection wells at the surface actually enters the Mississippi Chat formation and does not channel up the backside of the casing).

2. Warren American's injected water is confined solely to the Mississippi Chat formation. Also submitted along with this statement is the Affidavit of our Vice-

President of Operations, Mr. John Burroughs. As Mr. Burroughs affidavit describes, Warren American has taken additional steps to conclusively prove that the water it is injecting into its injection wells is not escaping somewhere between the surface and the Mississippi Chat formation. This is evidenced primarily by three radioactive injection profile tests which Warren American recently caused to be run by Associated Wireline Service, Inc. of Healdton, Oklahoma. These tests, results of which are attached to Mr. Burroughs affidavit, conclusively show that all waters injected into the Warren American wells enter the Mississippi Chat formation and do not escape between the surface and the Mississippi Chat or channel up the outside of the wellbores. The Cobb Report, referenced previously, also concludes, based on these injection profiles, that the injected water is confined solely to the Mississippi Chat formation.

3. Warren American injection wells have not "recently" failed MIT tests. There has been insinuation that Warren American's injection wells have "recently" failed MIT tests. This was alluded to in the public comments. Mr. Burroughs affidavit corrects the record with respect to these facts. A summary of Mr. Burroughs affidavit regarding these issues is as follows:

A) The Warren American C-W4 well (sometimes referred to as the C-1 well) did fail an MIT test on November 18, 2014 at which time all injection of fluids was discontinued. The well was subsequently plugged in 2016 as witnessed by the EPA.

B) The Warren American B-9 well failed an MIT on August 11, 2015. All injection was discontinued at that time. As Mr. Burroughs affidavit shows, efforts were made to repair the B-9 well which were ultimately

successful. Injection was re-commenced after the well successfully passed an MIT test on December 30, 2016. The B-9 well is currently taking water on a vacuum and injecting approximately 900 BWPD.

In summary, neither of these wells could have contributed to the pollution of Bird Creek which occurred in August, 2016 as neither had been in operation for a full year prior to the discovery at Monitoring Station No. 2. Also, neither had the type of failure that would permit injection into a shallow horizon.

Concurrent with our conclusion that Warren American is not responsible for the Bird Creek contamination, a separate likelihood has also been determined: that the contamination was a one-time event and there is no ongoing pollution into the creek. This topic is addressed in a second report, authored by Dr. Kerry Sublette, distinguished Professor of Environmental Engineering at the University of Tulsa. In addition to studying data provided by the EPA, Dr. Sublette walked the creek and supervised the measuring of salinity and temperature at several spots (beyond the EPA sondes) over time. Dr. Sublette's report is also being offered into the record today to support Warren American's observation that the salinity levels present in Bird Creek have declined over time, and are continuing to decline. This finding strongly supports the position that there is no ongoing pollution into the creek. In particular, the salinity levels at Monitoring Station No. 2, where initial reports found 80,000 parts per million of chlorides, have now fallen to below 1,000 parts per million-and continue to decline. Salinity also continues to fall at Monitoring Station No. 6, although the salinity measurements remain high in the deepest part of that pool. However, salinity readings 6" from the surface at Station No. 6

decrease rapidly to the 1500 ppm range. Dr. Sublette concludes that all observations of increased salinity can be explained by stratified flow and pool to pool transport of salts.

Another significant finding by Dr. Sublette is that the temperature anomalies observed at various depths of Bird Creek could readily be explained by solar heating of the dense saline layers. Therefore, communication with the creek and a deeper stratum would not be necessary to explain elevated temperatures at deeper, high salinity locations.

So that the record is clear, Warren American was requested to voluntarily shut-in all three of its injection wells on at least two occasions. The first time was from June 9 – June 16, in conjunction with the shut-in of all three of the operators' wells, at the EPA's request. The second shut-in began on August 9, to cooperate with the EPA's Proposed Administrative Order. From that date, for approximately thirty (30) days, Warren American's production facilities were completely shut down. As should be noted for the record, Warren American has no alternative source to take produced water off of the Chapman lease. Also, Warren American has been told by EPA personnel that no new permits, to drill a disposal well further to the north or to dispose of our produced water into different formations, will be approved. Without disposal wells, Warren American cannot produce the Chapman lease.

As a consequence of the foregoing, and in an effort to continue to gather scientific data, Warren American decided to reactivate its operations following the thirty (30) day shut-in. The reactivation occurred on September 8, 2017. From that date, Warren American has obtained readings from both Monitoring Station No. 2 and Monitoring Station No. 6 with the consent of the surface owner and with the knowledge of the EPA.

Dr. Sublette addresses those readings in his report. The bottom line is that the salinity levels continue to decline or remain steady, even after the Warren American's wells have been re-activated. This certainly suggests that the Warren American wells have not, and do not, contribute to the salt water that entered Bird Creek in August, 2016, nor does it appear that there is any current inflow of saltwater from any source.

In conclusion, it is Warren American's position that it, at all times, operated its wells in compliance with the terms of its underlying permits. We believe that the initial photographic evidence of oil and oil sheens in the creek in August, 2016, and the absence of any reported oil sheens subsequent to August, 2016, strongly substantiate that this was a one (1) time event. The gradual decline of the salinity of the water remaining in the creek also supports our conclusion that the pollution is not currently reoccurring. This is particularly true with respect to Warren American's wells which were voluntarily shut-in for an extended period of time. The evidence shows that prior to the Warren American shut-in, during the shut-in, and after injection activities were resumed, salinity levels within Bird Creek all continued a gradual and steady decline.

Warren American concurs with the recommendation in Dr. Sublette's Report, that the high salinity water in Monitoring Station No. 6 be drained; two or three times, if necessary. The salinity at that Station should continue to be monitored during this process.

Further, Warren American believes that the EPA's proposed order to permanently discontinue disposing of produced water into the Mississippi Chat is arbitrary and capricious, and is not supported by the data. As noted above, such an order would likely lead to an inability to produce the Chapman lease. Other alternatives are available, at

least on an interim basis, to monitor the situation. These would include: (1) lowering the allowed maximum injection pressure on the Warren American injection wells; (2) requiring an annual or biannual MIT test on Warren American injection wells; (3) conducting weekly monitoring and reporting of casing pressure, in addition to the current tubing pressure; and (4) requiring weekly monitoring of the salinity levels within Bird Creek for an extended period of time.

Warren American has not yet received all of the documents that it has requested from the EPA through various Freedom of Information Act requests. We respectfully request that we be provided adequate time to review and respond to this information once it is received.

Warren American is of the firm belief that its activities were not the cause of the observed pollution. Our expert reports show that the proposed order, as directed to Warren American, is not supported by scientific evidence and represents a finding of "guilt by association" that is not warranted. We honor our reputation for honesty and integrity in all matters pertaining to our operations and the proposed order deprives us of the ability to prove our innocence. We would strongly urge the EPA not to go forward with the proposed Administrative Order while data is indicating that no further contamination is occurring.

Attachments:

1) Report of Cobb & Associates

2) Report of Dr. Kerry Sublette

3) Affidavit of John D. Burroughs, P.E.

L:\1063.38\Opening Statement

RESERVOIR ENGINEERING STUDY

OF THE

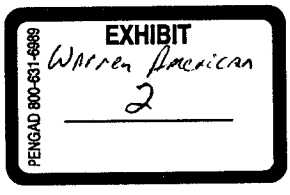
MISS CHAT RESERVOIR

OSAGE COUNTY OKLAHOMA

PREPARED FOR

WARREN AMERICAN OIL COMPANY

OCTOBER 2017



WILLIAM M. COBB & ASSOCIATES, INC.
Worldwide Petroleum Consultants

WILLIAM M. COBB & ASSOCIATES, INC.

Worldwide Petroleum Consultants

12770 Coit Road, Suite 907
Dallas, Texas 75251

(972) 385-0354
Fax: (972) 788-5165
E-Mail: office@wmcobb.com

October 6, 2017

Mr. Doug Norton
Warren American Oil Company
6585 South Yale, Suite 800
Tulsa, Oklahoma 74136

Re: Miss Chat Reservoir
Osage County, Oklahoma

Dear Mr. Norton:

At your request, I have reviewed two technical reports and various data items associated with waterflood operations in the Miss Chat reservoir in Osage County Oklahoma. My study addresses allegations that operators of water injection wells in the Miss Chat reservoir have failed to contain the water to the injection interval resulting in brine contamination at the surface, specifically in Bird Creek. The two technical reports which I have reviewed are:

1. "Bird Creek Investigation and Injection Well Response Action Plan", August 4, 2017, prepared by the US EPA Dallas office
2. "Comment Letter on Administrative Orders: SDWA-06-217-1110 (Jireh Resources, LLC); SDWA-06-2017-1112 (Novy Oil and Gas, Inc. (Grayhorse Operating, LLC)), and SDWA-06-2017-1111 (Warren American Company, LLC), September 1, 2017, prepared by Bill Biehl, PG, EH&S Manager, BEPCO, L.P. (on behalf of Osage Land & Cattle Co.)

Field History

The Miss Chat reservoir, also known as the "Blackland Pool" was discovered in 1922, according to a memo and technical data compiled by Mr. David Roberts[1], a petroleum engineering consultant. Very few wells were drilled until field wide development commenced in 1953. From 1953 to 1966, all produced water was disposed of into the Layton sand. A field-wide cooperative waterflood was implemented in 1966 by Texaco, Sun, and K-M Oil Co. This cooperative unit covered nine quarter sections, and produced water was re-injected into the Miss Chat reservoir. There is no evidence that makeup water was ever used on the Chapman lease.

[1] Memo dated October 3, 2017, by David Roberts.

This appears to be corroborated in a 1976 report by Keplinger and Associates, Inc.[2] which states that reservoir withdrawals have exceeded water injection.

Oil production for the specific Warren American Oil Company (WAOC) Chapman lease is unknown. However, the combined Jireh McComb and WAOC Chapman leases have produced about 4.1 million barrels of oil. Produced and injected water volumes are unknown. What is known, however, is that total water injection is less than total water production.

WAOC purchased the Chapman lease properties in December, 2013, from Link Oil & Gas. As shown on Exhibit 1, the Chapman lease borders the Jireh McComb lease on the east and south. Grayhorse operates another Miss Chat property about a mile southeast of the Chapman lease.

Current Reservoir Pressure

We know that only a portion of the produced volumes have been returned to the Miss Chat reservoir, which should have resulted in gradual pressure depletion over time. Current measurements of bottom-hole pressure (BHP) confirm this fact.

There are no early BHP readings available for the Miss Chat reservoir. However, original BHP (BHP_i) can be estimated using the following equation:

BHP_i = Avg. Depth * 0.433 psi/ft. (normal pressure gradient)

BHP_i = 2500 ft. * 0.433 psi/ft.

BHP_i = 1082 psi

WAOC has conducted recent BHP surveys in producing and injection wells, as shown in Exhibit 2. This test program indicates that the current pressure in the Miss Chat reservoir is between 900 and 950 psi, which is lower than original BHP. Significantly, this pressure ***is not*** sufficient to bring a column of brine water to the surface. In fact, the standing fluid levels measured in these tests ranged from 500 feet to 737 feet below the surface. Neither the EPA report nor the Osage Land and Cattle report dispute this finding. However, the EPA claims that injection operations could force water to the surface (page 2, bullet 4).

In Mr. Biehl's report, he spends considerable time and text showing what allowable injection surface pressures are and what the calculated downhole pressure would be, ***IF*** the maximum allowed surface pressures were used (see Reservoir Engineering – Allowable Injection Pressure section, page 10). This is irrelevant to the WAOC wells, which are operated with surface pressures as shown from recent tests:

1. Well B7 > Injecting 1146 BWPD with **135 psi surface pressure**. Measured BHP while injecting was 1285 psig at 2517 feet (0.511 psi/ft.). When shut-in, the surface ***went on a vacuum*** in 20 seconds. BHP dropped from 1285 psig to 1086 psig in 15 minutes and was still dropping when the gauges were pulled.

[2] An Evaluation of Interests Owned by K-M Oil Company, Blackland Pool, Osage County, Oklahoma as of July 1, 1976.

2. Well B8 > injecting 858 BWPD with 27" ***vacuum*** at the surface. Measured BHP while injecting was 1149 psig at 2546 feet (0.451 psi/ft.).
3. Well B9 > injecting 1168 BWPD with 27" **vacuum** at the surface. Measured BHP while injecting was 1160 psig at 2557 feet (0.454 psi/ft.).

The tests shown above clearly show that bottom hole injection pressures are not excessive. In fact, this is one of the most "gentle" waterfloods, in terms of bottom-hole injection pressure gradient, that I have seen in my 35+ year career.

The average injection pressure gradient in the WAOC wells is 0.472 psi/ft. This is sufficient to bring brine water close to the surface ***IF*** there is a high conductivity breach, right at the wellbore. However, WAOC has run mechanical integrity tests (MIT's) and injection profile surveys which do not indicate any such breach. Therefore, in order for injected brine to reach the surface, it must first travel through the reservoir to a nearby well with compromised integrity to find a path to the surface. In doing so, the injected water loses most of its energy (pressure) within a few feet of the injection well, leaving it incapable of lifting a column of water to the surface. Exhibit 3 is cartoon diagram of the theoretical pressure distribution in an oil reservoir from an injection well to a producing well. I have placed actual pressure values on this diagram; however, the shape of the pressure trend near the wells is implied from theory.

To further illustrate this point, I have made a calculation of the pressure drop from an injector to a point 660 feet away (10 acre well spacing) for a reservoir with a permeability value of 50 md. Results of this calculation are shown graphically in Exhibit 4. Note on Exhibit 4, that more than 90 percent of the pressure drop from the injector to the producer occurs within 10 feet of the injection well. Again, this indicates that any pathway more than a few feet from the injection well cannot deliver water with sufficient pressure to bring it close to the surface.

Miss Chat Frac Gradient

In the Osage Land and & Cattle Co. report, Mr. Biehl speculates that the frac gradient for the Miss Chat reservoir will likely be low, perhaps around 0.5 psi/foot due to the rock being a "soft , weathered chert". In my experience this 0.5 psi/foot frac gradient is too low. In fact, a 1967 frac treatment report for the K-M Chapman F-1 well shows a frac gradient of about 0.70 psi/foot, which I find to be quite normal. Using that value, the surface pressure required to frac the Miss Chat reservoir would be calculated as follows:

Frac Pressure (FP) = BHP= SURFP + HP – FP (Biehl equation, page 10)

Rearranging this equation to solve for the surface pressure (Max SURFP) at which the Miss Chat will frac:

Max SURFP = BHP (frac pressure) – HP + FP

Max SURFP = (0.70*2500) – (2500*0.433*1.07) + 49

Max SURFP = 641 psi

As shown in the previous section, WAOC well B7 is injecting with 135 psi surface pressure, while the B8 and B9 wells take water on a vacuum. Clearly, none of the WAOC injection wells are injecting at or above the frac gradient. Conversely, all three wells are injecting ***well under*** the frac gradient.

Fluctuations in TDS Measurements

On page 6 of the EPA report, in bullet 4, the EPA contends that fluctuations in the TDS readings are due to injection pump cycling. This contention is technically flawed in at least two ways:

1. Injection pumps cycling would send pressure pulses through the reservoir. Note that these pressure pulses diffuse with distance from the injector and are almost imperceptible a short distance from the injector.
2. Injection pump cycling would have no impact on the chemical composition of the water being produced at a distant location.

It is very likely that the fluctuating TDS values cited by the EPA are due to temperature fluctuations when the samples were taken. Exhibit 5 is a graph of TDS and temperature measurements from MP6. Note the cyclic behavior of both temperature and TDS. The dark blue border on Exhibit 5 shows the time period when field injection operations were shut down. Exhibit 6 shows this same data with the time scale focused on the period when injection operations were shut-in. Note that the temperature and TDS values cycle on a 24-hour period. This is simply the effect of daytime heating and nighttime cooling on the constant composition water in the pool at MP6. This data provides no evidence of any link between injection well operations and surface water quality in Bird Creek.

Exhibit 7 presents TDS data for stations 2 and 6 obtained by the EPA, Bureau of Indian Affairs (BIA), and WAOC. Cumulative rainfall is also displayed on this graph. This graph shows that with passing time and periodic rainfall, the TDS readings at both stations 2 and 6 are declining. Upstream station 2 has returned to normal conditions. Downstream station 6, which is deeper than station 2, shows a declining TDS trend. This graph clearly shows that there is no ongoing release of Miss Chat water into Bird Creek.

Conclusions

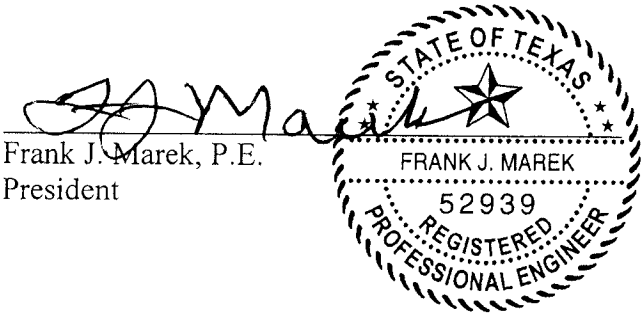
1. Analysis of available data indicates that the release of brine water into Bird Creek in August of 2016 was a one-time event.
2. The Miss Chat reservoir has been gradually voided over time, causing a gradual reduction in pressure, from an original value of about 1082 psi to a current value of about 925 psi.
3. The current average Miss Chat reservoir pressure is not sufficient to bring reservoir fluids to the surface.
4. Current reservoir pressure can bring a column of brine water no higher than about 500 feet from the surface. This is corroborated by recent BHP and fluid level measurements.
5. The three WAOC injection wells have passed MIT tests and all have had injection profile surveys run, indicating that injected fluids are not escaping the reservoir at these wells.

6. Current bottom-hole injection pressures at the WAOC wells are well below the Miss Chat frac gradient of about 0.70 psi/foot.
7. If fluids are escaping the reservoir any distance from the injection wells, there will be insufficient pressure to bring fluids higher than about 500 feet from surface.
8. Fluctuations (noise) in the TDS and temperature readings cited by the EPA are simply cyclic events associated with temperature variations over each 24 hour period. These are normal and to be expected, and are not an indication of communication from injection wells to the surface.

I appreciate the opportunity to assist Warren American Oil Company in this matter. Should you have any questions regarding the subject report or conclusions, please do not hesitate to contact me.

Sincerely,

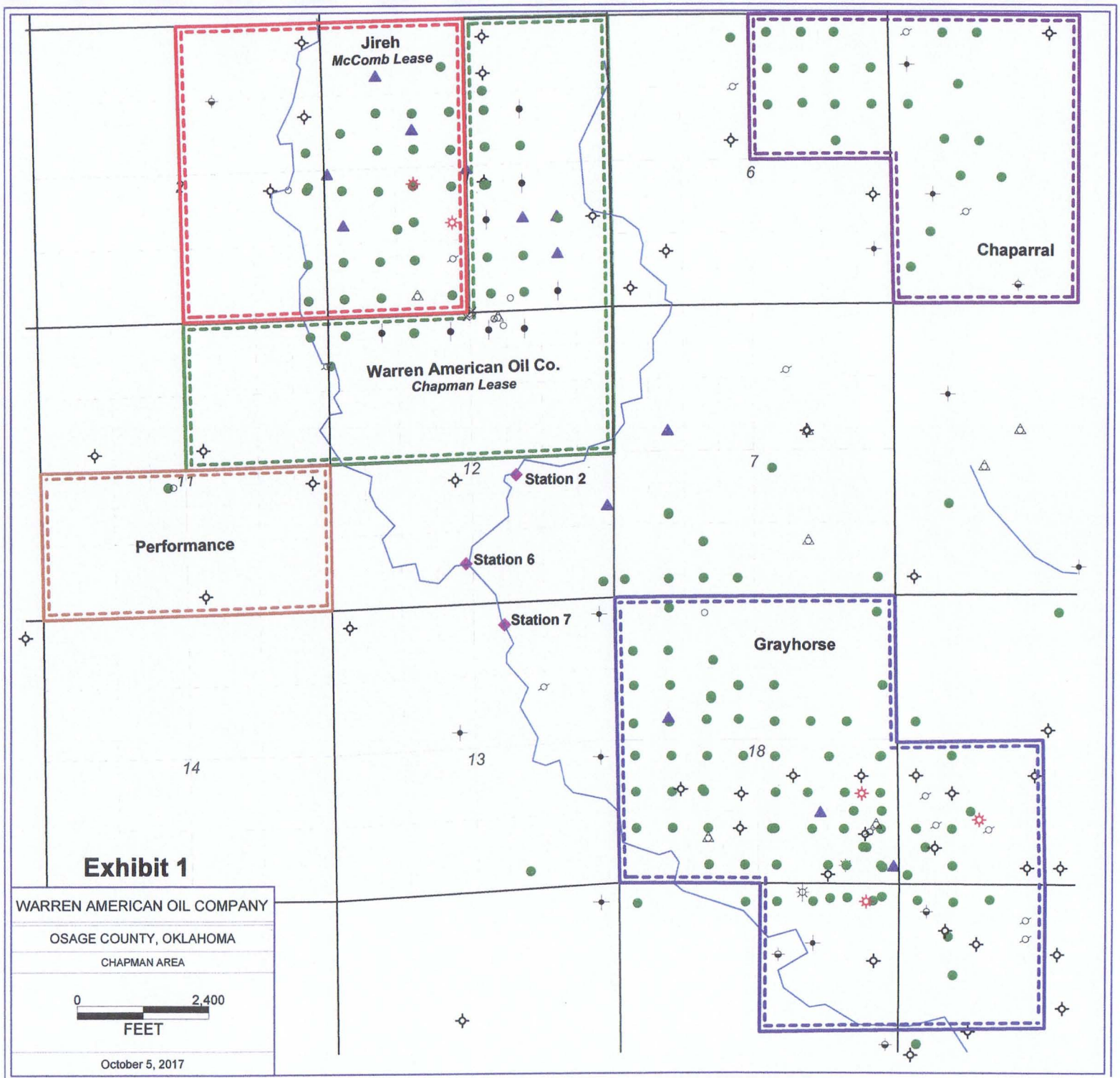
WILLIAM M. COBB & ASSOCIATES, INC.
Texas Registered Engineering Firm F-84



Frank J. Marek, P.E.
President

FJM: ar
Attachments
M/Warren America/Miss chat Reservoir 100617

EXHIBITS


Jireh
McComb Lease
Chaparral
Warren American Oil Co.
Chapman Lease
Performance
Station 2
Station 6
Station 7
Grayhorse
6
7
11
12
13
14
18
Exhibit 1
WARREN AMERICAN OIL COMPANY
OSAGE COUNTY, OKLAHOMA
CHAPMAN AREA
0
2,400
FEET
October 5, 2017

Warren Americal Oil Company

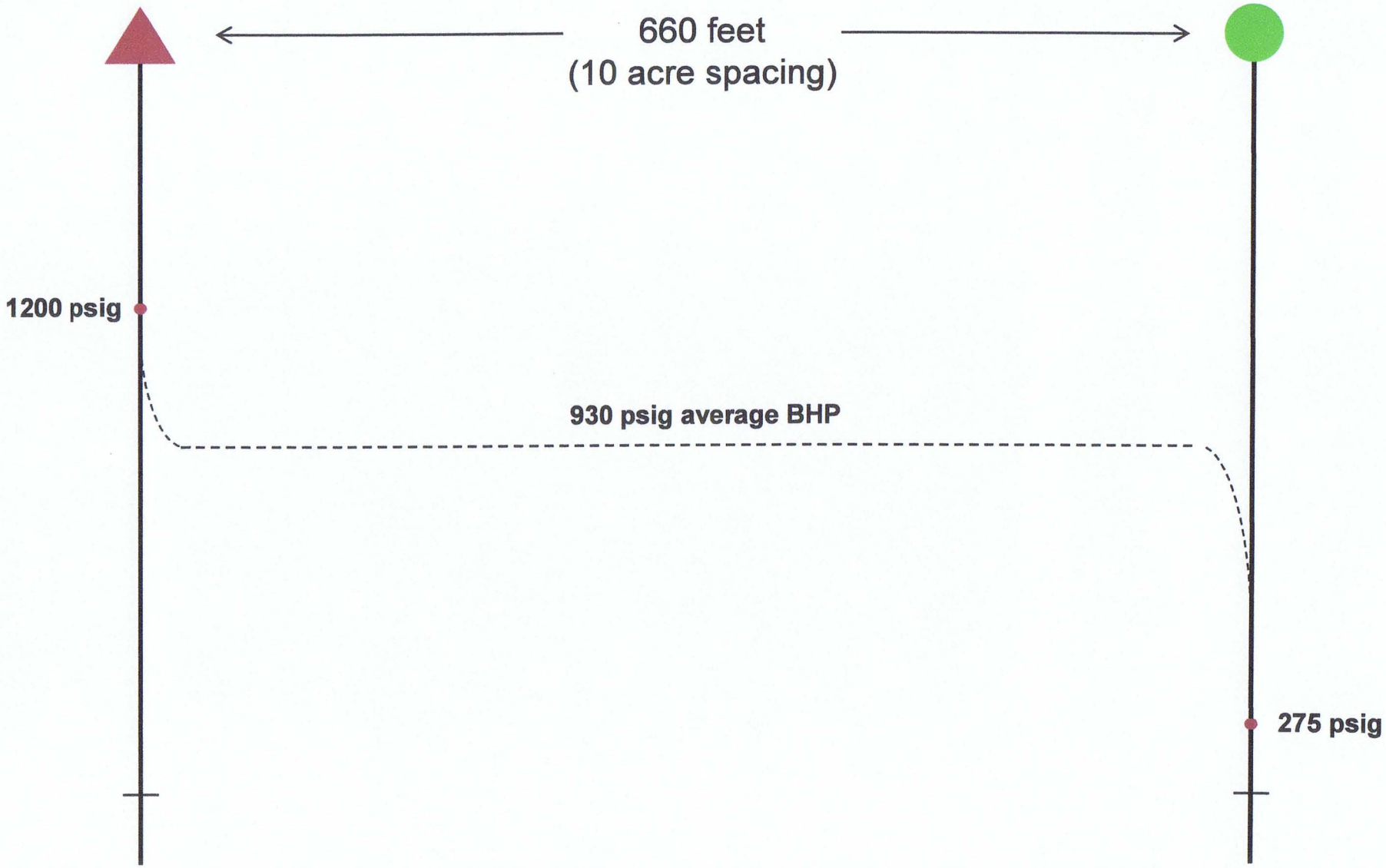
Recent Chapman Lease BHP Data

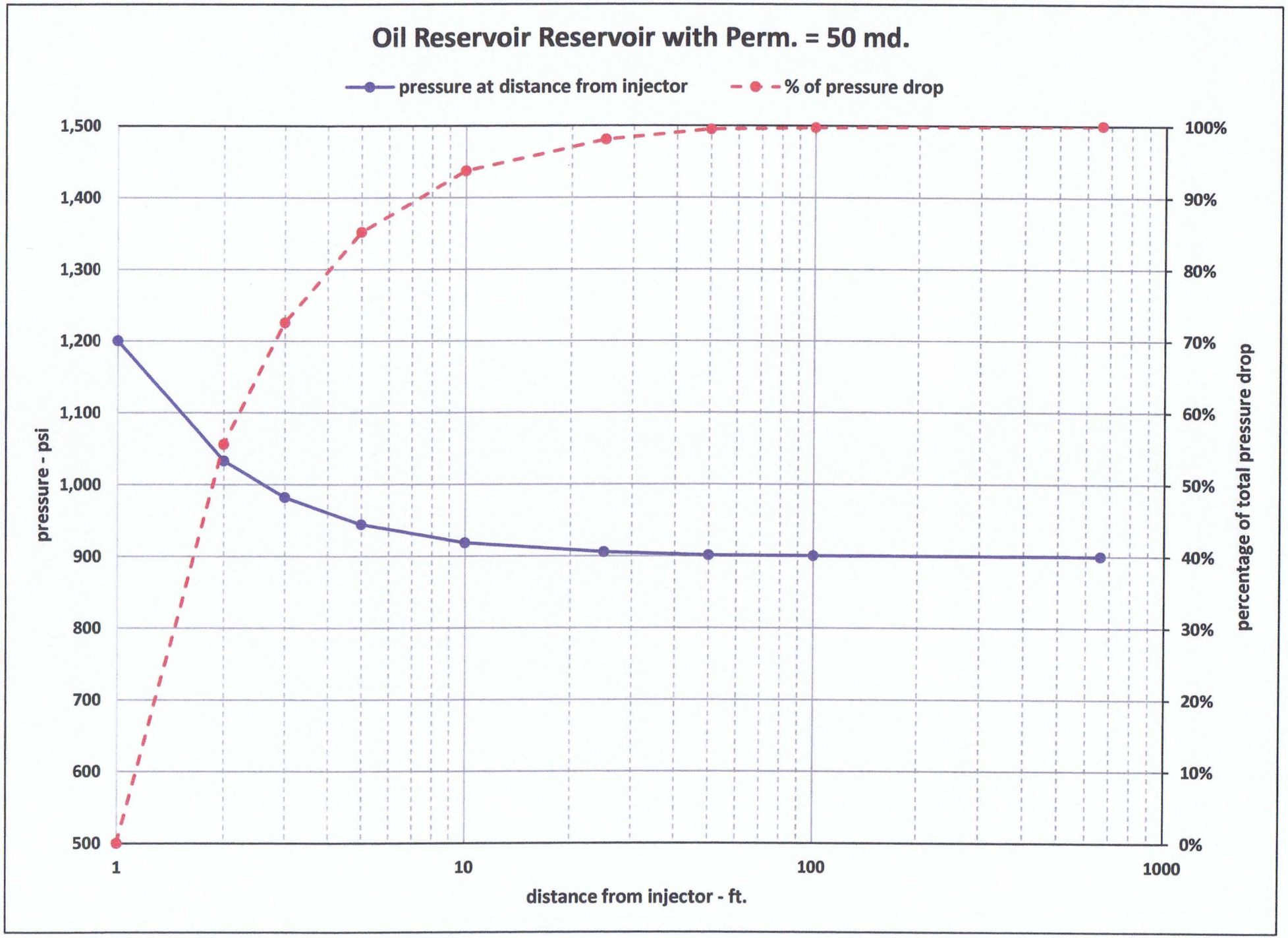
Well	Well Type	Date	MPOP	BHP, psig	BHT	fluid level ft. from Surf.	type of test
B7	injector	08/31/17	2517	898	N/A	631	acoustic F.L.
B8	injector	08/31/17	2546	932	N/A	590	acoustic F.L.
B8	injector	09/07/17	2546	953	107	592	wireline gauge
B9	injector	08/31/17	2556	871	N/A	737	acoustic F.L.
B9	injector	09/07/17	2556	904	113	728	wireline gauge
E3	producer	09/07/17	2497	973	122	506	wireline gauge
E3	producer	09/07/17	2497	885	N/A	500	acoustic F.L.
					Avg. =	612	

overall average = 917

wireline BHP Avg. = 943

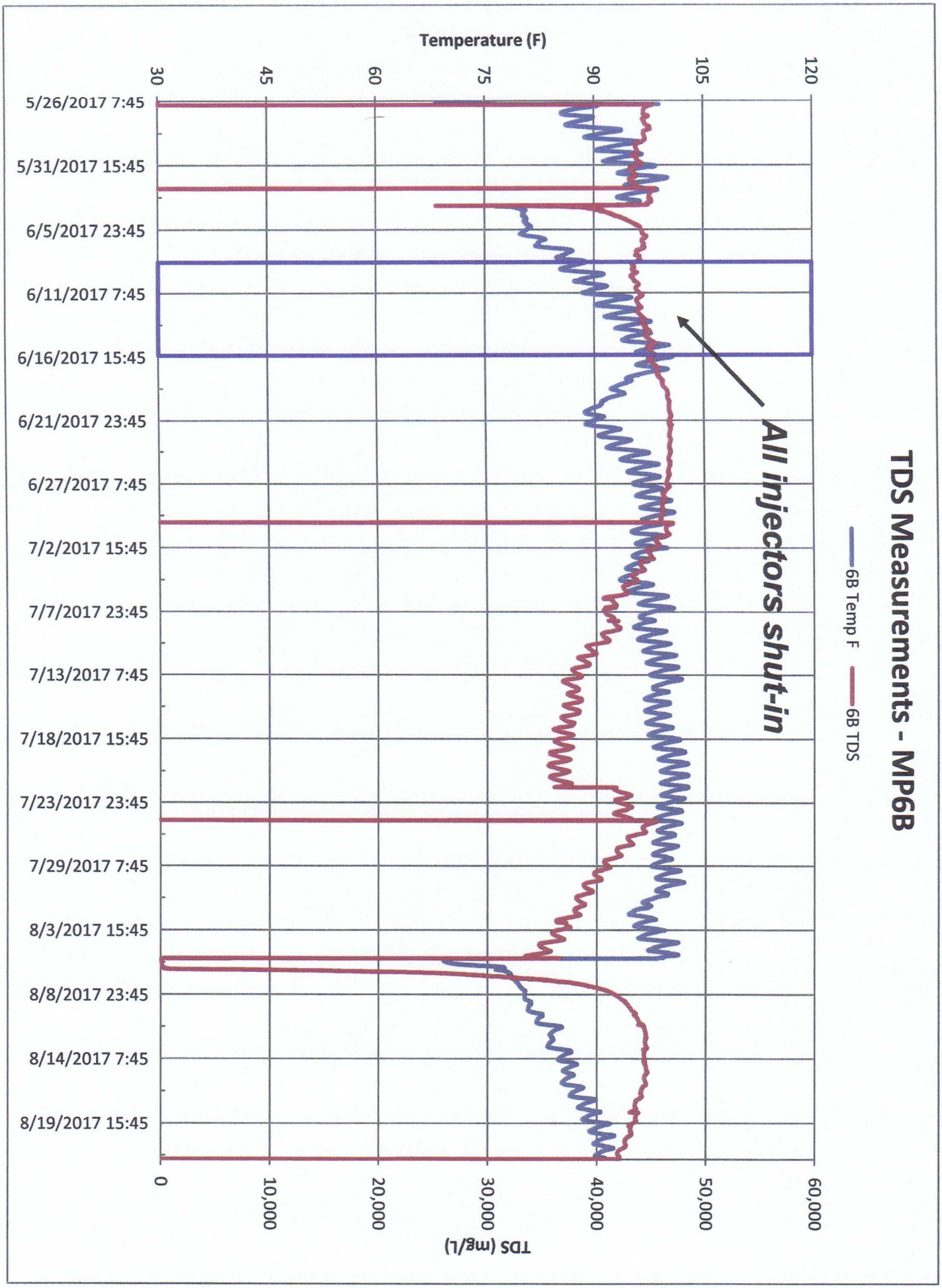
Theoretical Pressure Distribution – Injector to Producer





William M. Cobb & Associates, Inc.

Exhibit 4


TDS Measurements - MP6B
Temperature (F)
30
45
60
75
90
105
120
5/26/2017 7:45
5/31/2017 15:45
6/5/2017 23:45
6/11/2017 7:45
6/16/2017 15:45
6/21/2017 23:45
6/27/2017 7:45
7/2/2017 15:45
7/7/2017 23:45
7/13/2017 7:45
7/18/2017 15:45
7/23/2017 23:45
7/29/2017 7:45
8/3/2017 15:45
8/8/2017 23:45
8/14/2017 7:45
8/19/2017 15:45
All injectors shut-in
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6B TDS
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30,000
40,000
50,000
60,000
TDS (mg/L)

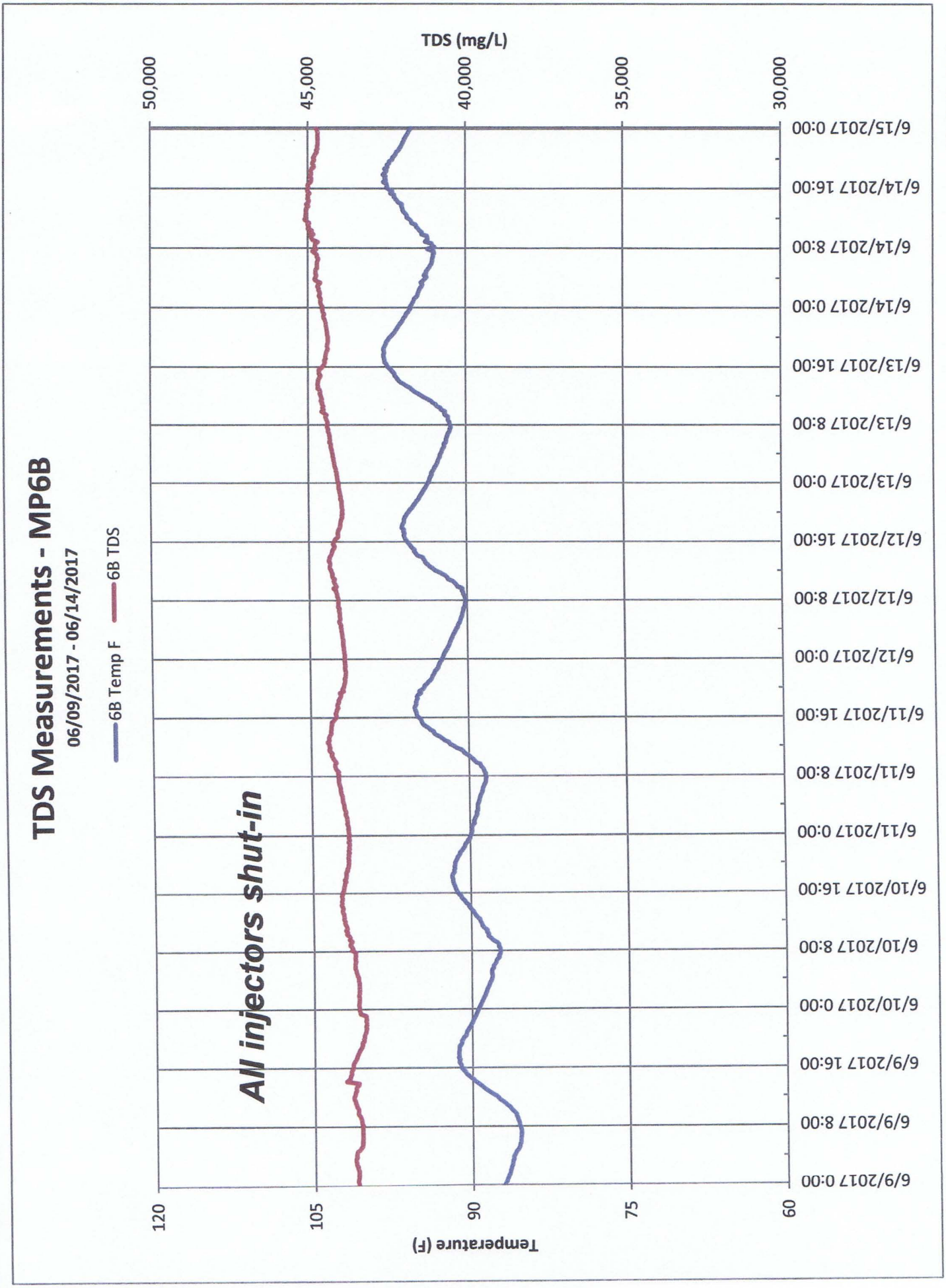
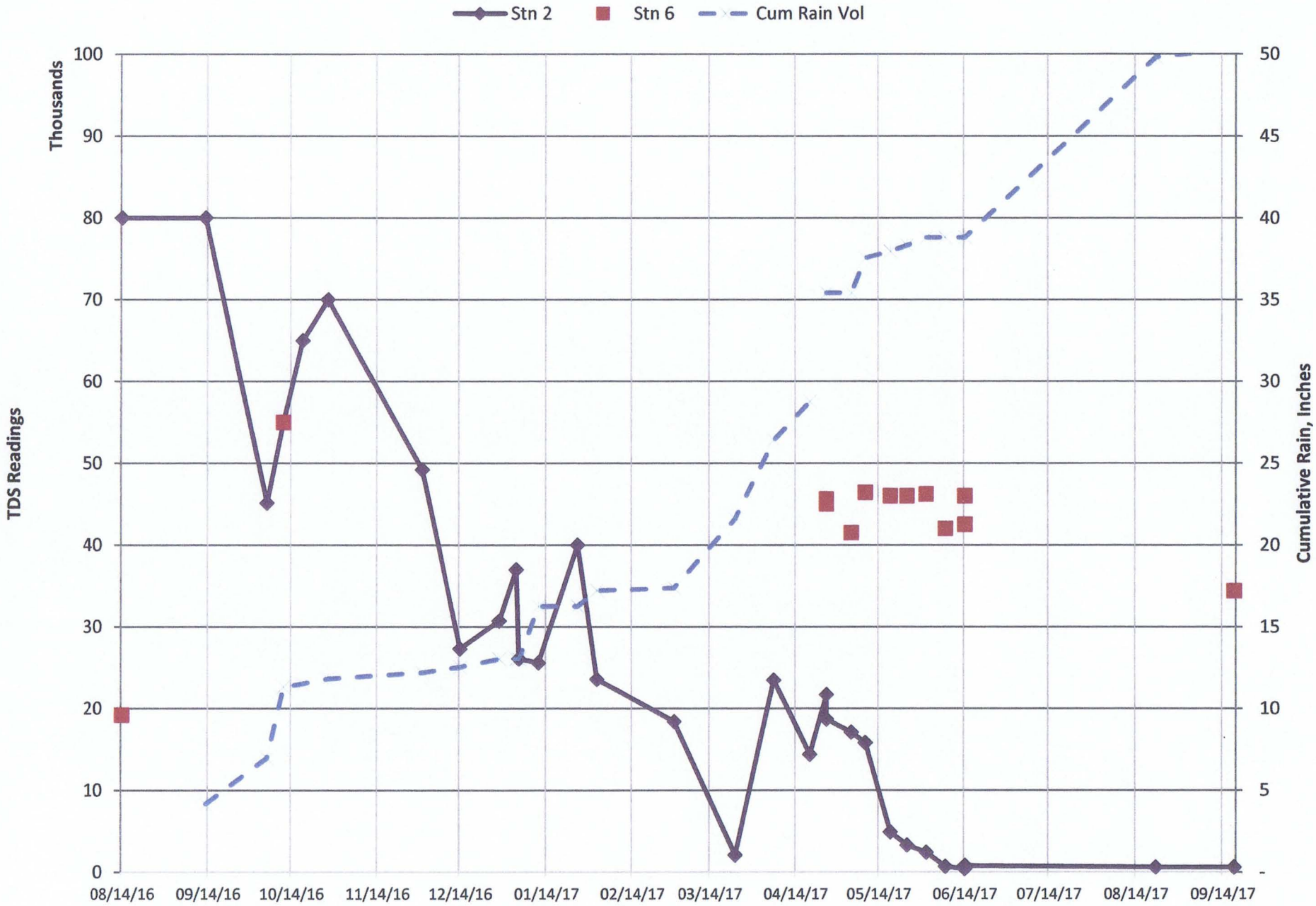


Exhibit 6

William M. Cobb & Associates, Inc.

Bird Creek - TDS Readings



William M. Cobb & Associates, Inc.

Exhibit 7

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY, REGION 6
DALLAS, TEXAS

In the matter of:	§	**Docket No. SDWA-06-2017-1111**
Warren American Oil Company, LLC	§	**RESPONDENT'S ANSWER TO PROPOSED ADMINISTRATIVE ORDER AND REQUEST FOR HEARING**
RESPONDENT	§	

AFFIDAVIT OF JOHN D. BURROUGHS

STATE OF OKLAHOMA)
) ss.
COUNTY OF TULSA)

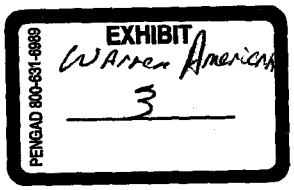
COMES NOW John D. Burroughs, upon his oath and being duly sworn alleges and states as follows:

1. That I am a resident of Tulsa County, Oklahoma, am over the age of 21 years and I have personal knowledge of the facts set forth in this Affidavit.

2. That I am a practicing petroleum engineer with over 37 years of experience in the operation and production of oil and gas properties in Oklahoma.

3. That I currently serve as the Vice-President, Operations, of Warren American Oil Co. ("WAOC").

4. That I, or employees of WAOC working under my supervision and control, have caused salinity readings to be made on "Bird Creek" on September 18, 2017 and on October 4, 2017. The results of these readings are contained on Exhibit "A" attached hereto and made a part hereof. These readings were taken by WAOC after reactivating its disposal wells on the Chapman lease on or about September 8, 2017.



5. That in my capacity as Vice-President of Operations, I retained Associated Wireline Service, Inc. to run injection profiles on Warren American's B-7, B-8 and B-9 disposal wells located on the Chapman lease on September 12, 2017 and October 2, 2017. The results of these injection profiles (attached hereto as Exhibit B-1, B-2 and B-3) show that the fluid going into the subject well is going into the perforations of said wells and into the Mississippi Chat formation. None of the injection profiles indicate that any fluid is channeling upwards behind pike.

6. That in my capacity as Vice-President of Operations, employees of WAOC under my supervision and control, witnessed the failure of a Mechanical Integrity Test (MIT) on the Chapman C-W4 and the Chapman B9 wells. The C-W4 failed its test on November 18, 2014 at which time the well was injecting approximately 600 BWPD with pressure ranging from 20" vacuum to 50 PSIG. Injection was immediately stopped. Subsequent wellwork on the well found a hole in a joint of tubing. After pressure testing the tubing and replacing several joints the packer and tubing was re-run into the well but again the well failed its MIT. The well was temporarily abandoned and fluid level monitoring occurred as per EPA regulations. A decision to plug the well was made in November 2016 and the well was plugged per EPA instructions and witnessed by EPA personnel. The B9 well failed its MIT on August 11, 2015 and injection was discontinued. The tubing was pulled and several leaks in the threads were discovered which were then replaced. The casing was tested from 900' to the surface and held pressure but the well again failed to pass its MIT as the casing pressure slowly bled off more than the allowable amount when the entire casing was pressure tested. The well was temporarily abandoned and fluid level monitoring occurred. The well was then re-worked and passed its MIT in December

2016 and injection began on December 30, 2016. The well is presently taking water at approximately 900 BWPD on a vacuum.

FURTHER AFFIANT SAYETH NOT.

John D. Burroughs

Subscribed and sworn to before me this 10th day of October, 2017.

Notary Public

My Commission Expires:

8/22/20
#11152

CHERYL DIXON
Notary Public
State of Oklahoma
Commission #00011152
Expires: August 22, 2020

L:\1063.38.Affidavit

Bird Creek - TDS Readings - Taken by Warren American Oil

All readings taken with a YSI Salinity Meter

	Sept 18, 2017			October 4, 2017				
	TDS, ppm	Depth	TDS, ppm	Temp, *C	SC, uS	Salinity, PPT	Estimated Depth to Btm
EPA Monitoring Stn 2	501						
EPA Monitor Stn 6	34,360	Bottom	34,800	28.7	53600	33.0	9'
EPA Monitor Stn 6		6" below Surf	1,670	23.3	2570	1.4	
10' Upstream Stn 6		Bottom	34,790	29.6	53500		9'
10' Upstream Stn 6		6" below Surf	1,674	23.2	2578		
20' Upstream Stn 6	32,970	Bottom	33,930	28.8	52400		8'
20' Upstream Stn 6		6" below Surf	1,609	23	2484		
50' Upstream Stn 6	4,444	Bottom	18,890	26.8	30320		7'
50' Upstream Stn 6		6" below Surf	1,640	23	2521		
10' Downstream Stn 6	33,780	Bottom	35,220	29.1	53800		8'
10' Downstream Stn 6	1,519	6" below Surf	1,644	23.2	2534		
20' Downstream Stn 6		Bottom	32,750	24.4	50100		5'
20' Downstream Stn 6		6" below Surf	1,676	22.9	2548		
50' Downstream Stn 6	2,695	Bottom	1,726	22.9	2643		1'
50' Downstream Stn 6		6" below Surf	1,696	22.8	2610		
By low water crossing EPA Monitor Stn	3,263	Bottom	3,742	22.3	5760		
By low water crossing EPA Monitor Stn		6" below surf	3,181	22.4	4900		
By low water crossing - 25' upstream		Bottom	3,690	22.4	5680		
By low water crossing - 25' upstream		6" below surf	3,399	22.2	5290		
By low water crossing - 50' upstream		Bottom	3,412	22.2	5050		
By low water crossing - 50' upstream		6" below surf	3,215	22.2	4930		
By low water crossing - 25' downstream		Bottom	3,820	22.3	5880		
By low water crossing - 25' downstream		6" below Surf	3,170	22.3	4867uS		
By low water crossing - 50' downstream		Bottom	3,516	22.4	5380		
By low water crossing - 50' downstream		6" below Surf	3,152	22.4	4523		

Exhibit "A"

ASSOCIATED WIRELINE SERVICE. Inc

580-229-0731 · Box 906 · Healdton, Oklahoma 7343

Exhibit "B-1"

FILING NO.

COMPANY WARREN AMERICAN OIL CO., LLC

WELL CHAPMAN #B-9

FIELD N/A

COUNTY OSAGE STATE OK.

LOCATION

SEC 1 TWP 27N RGE 7E

TYPE SERVICES:
INJECTION PROFILE

PERMANENT DATUM ELEV. ELEV K.B

LOG MEASURED FROM FT ABOVE PERM DATUM D.F.

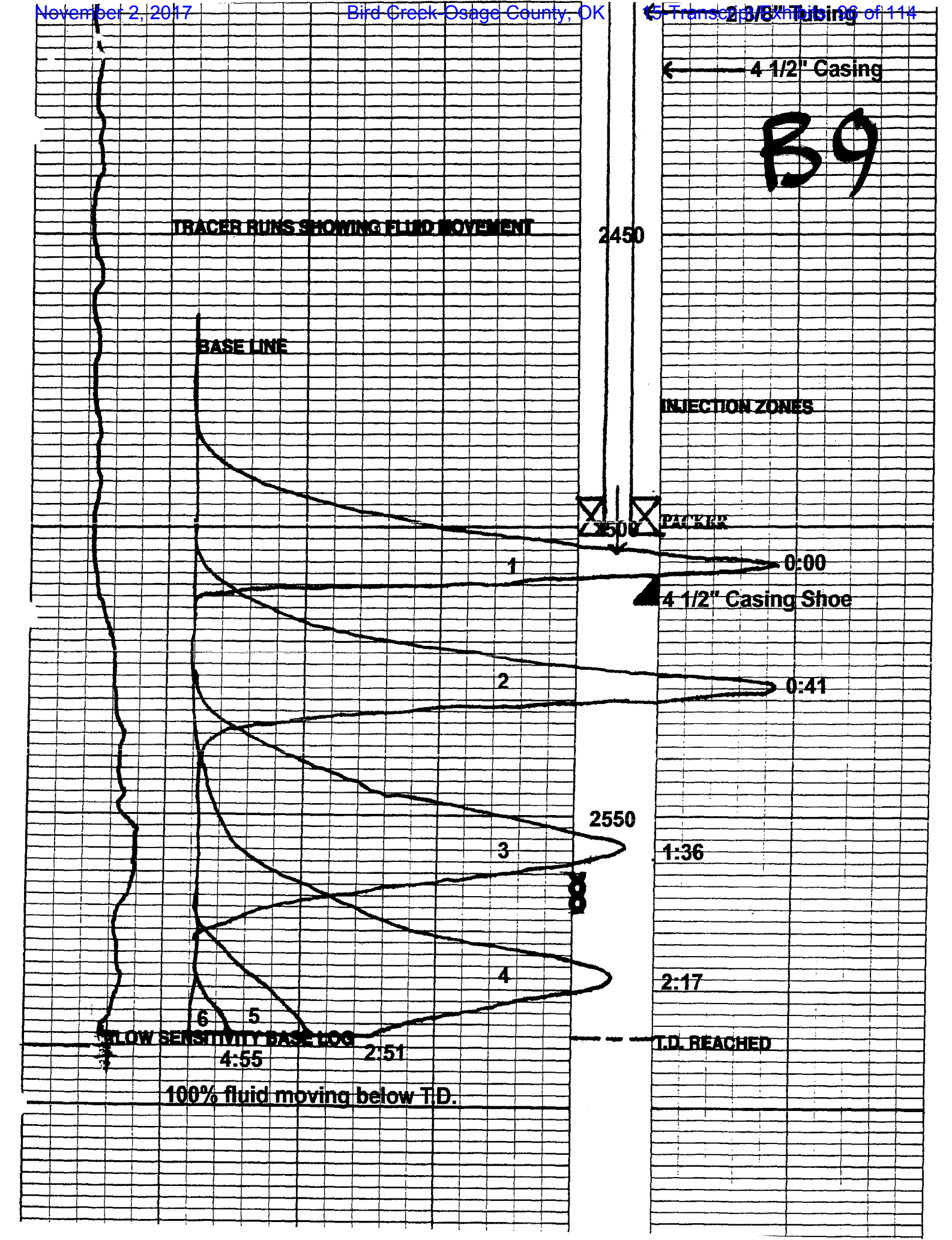
DRILLING MEASURED FROM G.L.

DATE	9/12/2017					INJECTION	
RUN NO.	ONE					PRESSURE	
TYPE LOG	INJECTION PROFILE					RATE	877 BD
DEPTH-DRILLER	2586 PBTD					FLUID	WATER
DEPTH-LOGGED	2588					ISOTOPE	I-13
BOTTOM LOGGED INTERVAL	2588					8 DAY HALF LIFE	
TOP LOGGED INTERVAL	2400						
TYPE FLUID IN HOLE	WATER	CASING AND TUBING RECORD					
LEVEL	~~~~	SIZE	WGT	TYPE	FROM	TO	
RECORDING SPEED	25'/MIN	5 1/2"			0	260	
TOOL SIZE	1"	4 1/2"	11.6#		0	251	
RECORDED BY	COX	2 3/8"		S.T.	0	250	
WITNESSED BY							

PERFORATIONS 2560-67

REMARKS: SEE NOTE BELOW.

Exhibit "B-1"


2 3/8" Tubing
4 1/2" Casing
B9
TRACER RUNS SHOWING FLUID MOVEMENT
2450
BASE LINE
INJECTION ZONES
2500
PACKER
1
0:00
4 1/2" Casing Shoe
2
0:41
2550
3
1:36
4
2:17
6
5
LOW SENSITIVITY BASE LOG
4:55
2:51
T.D. REACHED
100% fluid moving below T.D.

PERCENT OF INPUT PERCENT PER FOOT

GAMMA LOG

R/A FOLLOW UP TRACER

RADIO ACTIVITY INCREASES

PERFORATIONS FROM CUSTOMERS RECORDS

SLOTS

CHANNEL

WARREN AMERICAN OIL CO., LLC
CHAPMAN #B-9
N/A FIELD
OSAGE CO., OK.
9/12/2017

Sta. Num.	Rate Bbls. Day	Depth. Interval	Percent of Fluid Going Below Base of Interval	Percent of Fluid Lost in Interval	Press P.S.I.
	877	100% FLUID MOVING BELOW T.D.			0
	NOTE:	NO LEAKS OR CHANNELS INDICATED UNDER EXISTING			
		INJECTION CONDITIONS.			

ASSOCIATED WIRELINE SERVICE. Inc.

580-229-0731 • Box 906 • Healdton. Oklahoma 73438

Exhibit "B-2"

FILING NO.

COMPANY WARREN AMERICAN OIL CO., LLC

WELL CHAPMAN #B-8

FIELD N/A

COUNTY OSAGE STATE OK.

LOCATION

SEC 1 TWP 27N RGE 7E

TYPE SERVICES: INJECTION PROFILE

PERMANENT DATUM ELEV. ELEV K.B.

LOG MEASURED FROM FT ABOVE PERM DATUM D.F

DRILLING MEASURED FROM G.L

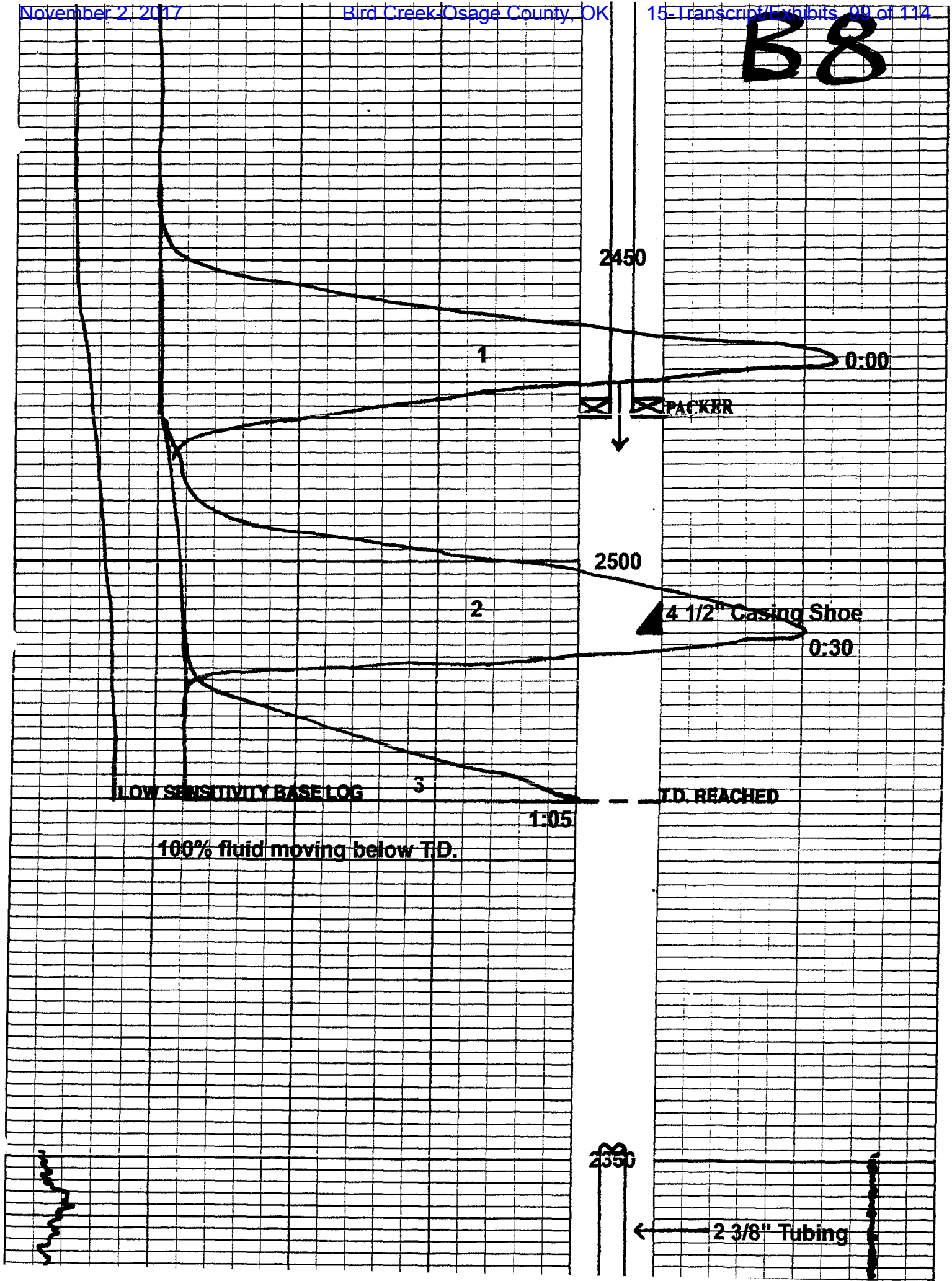
DATE	9/12/2017					INJECTION	
RUN NO.	ONE					PRESSURE	0
TYPE LOG	INJECTION PROFILE					RATE	885 BD.
DEPTH-DRILLER	2575 PBTD					FLUID	WATER
DEPTH-LOGGED	2540					ISOTOPE	I-131
BOTTOM LOGGED INTERVAL	2540					8 DAY HALF LIFE	
TOP LOGGED INTERVAL	2350	CASING AND TUBING RECORD					
TYPE FLUID IN HOLE	WATER	SIZE	WGT	TYPE	FROM	TO	
LEVEL	~~~~	5 1/2"			0	2591	
RECORDING SPEED	25'/MIN	4 1/2"	10.5#		0	2512	
TOOL SIZE	1"	2 3/8"		S.T.	0	2476	
RECORDED BY	COX						
WITNESSED BY							

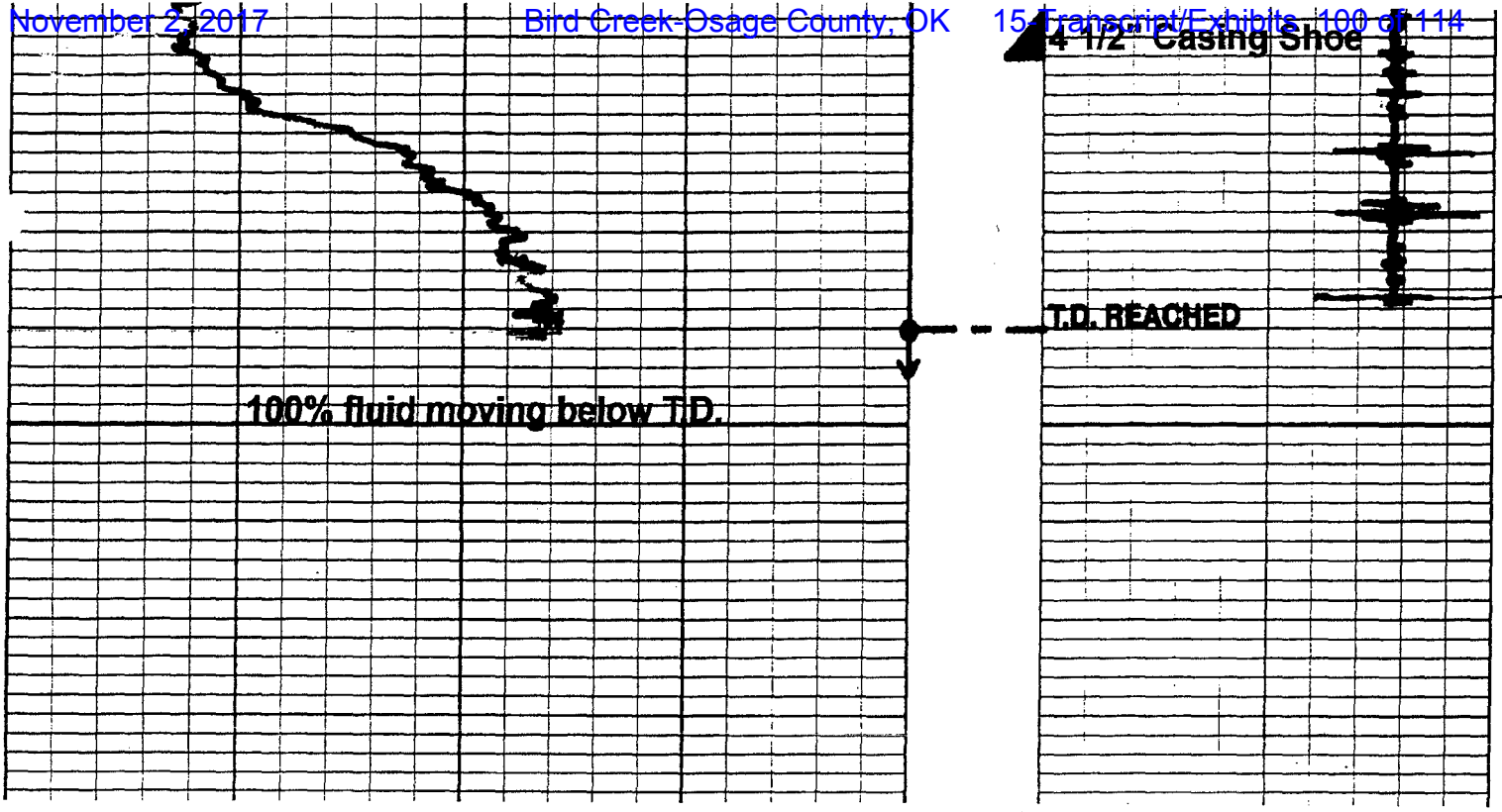
PERFORATIONS 2540-52

REMARKS: SEE NOTE BELOW.

Exhibit "B-2"

B8


2450
1
0:00
PACKER
2500
2
4 1/2" Casing Shoe
0:30
LOW SENSITIVITY BASE LOG
3
T.D. REACHED
1:05
100% fluid moving below T.D.
2350
2 3/8" Tubing



2 5 5 0 7 5 10 0

PERCENT OF INPUT

1 0 2 0 3 0 4 0 5 0

PERCENT PER FOOT

_____ GAMMA LOG

_ _ _ _ _ _ _ _ R/A FOLLOW UP TRACER

RADIO ACTIVITY INCREASES

PERFORATIONS FROM CUSTOMERS RECORDS

SLOTS

CHANNEL

WARREN AMERICAN OIL CO., LLC
CHAPMAN #B-8
N/A FIELD
OSAGE CO., OK.
9/12/2017

Sta. Num.	Rate Bbls. Day	Depth. Interval	Percent of Fluid Going Below Base of Interval	Percent of Fluid Lost in Interval	Press P.S.I.
	885	100% FLUID MOVING BELOW T.D.			0
	NOTE:	NO LEAKS OR CHANNELS INDICATED UNDER EXISTING			
		INJECTION CONDITIONS.			

ASSOCIATED WIRELINE SERVICE. Inc.

580-229-0731 · Box 906 · Healdton. Oklahoma 73438

Exhibit "B-3"

FILING NO.

COMPANY WARREN AMERICAN OIL CO., LLC

WELL CHAPMAN #B-7

FIELD N/A

COUNTY OSAGE STATE OK.

LOCATION

API #35-113-34148

SEC 1 TWP 27N RGE 7E

TYPE SERVICES:
INJECTION PROFILE

PERMANENT DATUM ELEV. ELEV. K.B

LOG MEASURED FROM 8 FT ABOVE PERM DATUM D.F

DRILLING MEASURED FROM G.L.

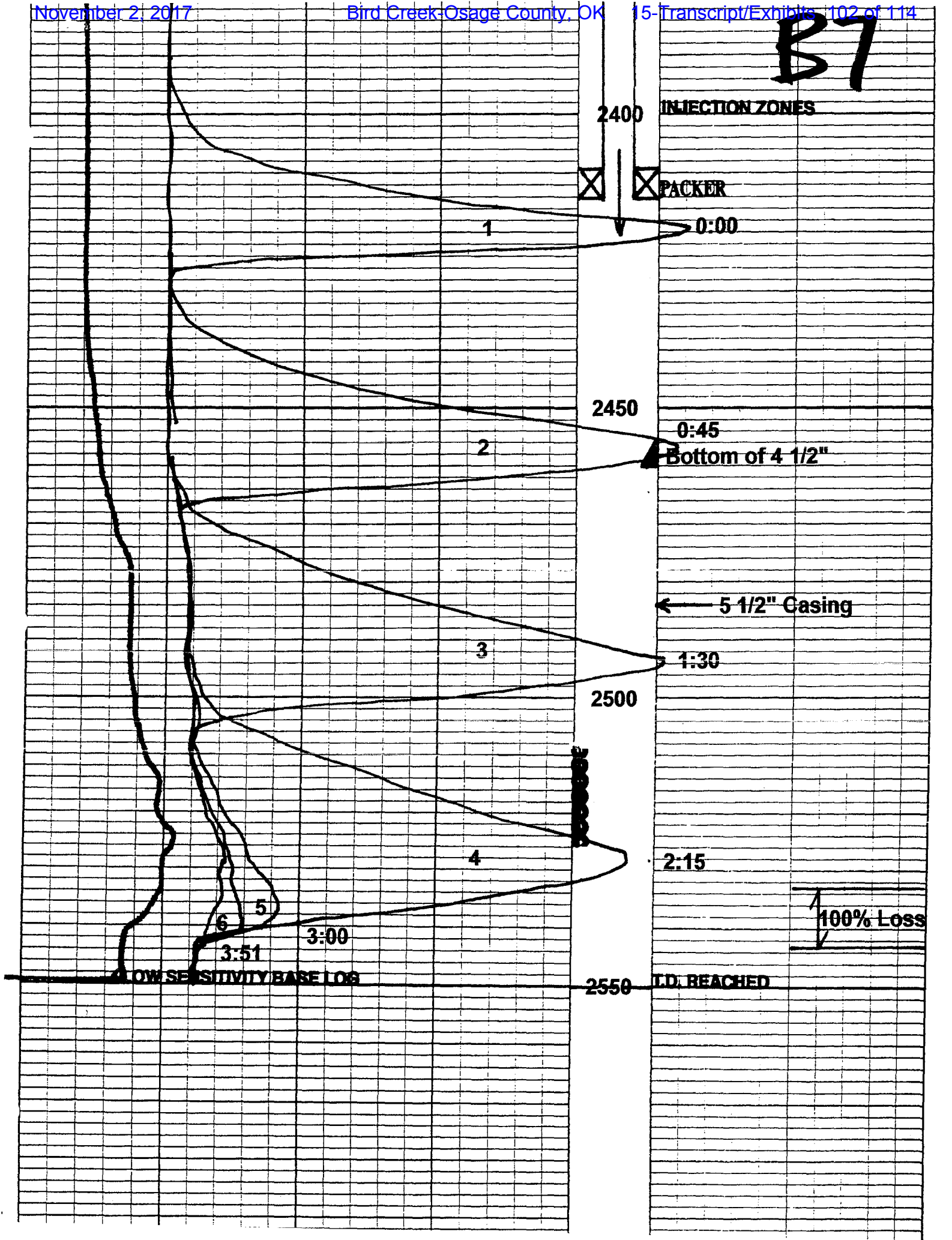
DATE	10/2/2017					INJECTION	
RUN NO.	ONE					PRESSURE	120#
TYPE LOG	INJECTION PROFILE					RATE	1138 BD.
DEPTH-DRILLER	2551					FLUID	WATER
DEPTH-LOGGED	2550					ISOTOPE	I-131
BOTTOM LOGGED INTERVAL	2550					8 DAY HALF LIFE	
TOP LOGGED INTERVAL	2300						
TYPE FLUID IN HOLE	WATER	CASING AND TUBING RECORD					
LEVEL	FULL	SIZE	WGT	TYPE	FROM	TO	
RECORDING SPEED	25'/MIN	5 1/2"	14#		0	2551	
TOOL SIZE	1"	2 3/8"		S.T.	0	2414	
RECORDED BY	COX	4 1/2"			0	2460	
WITNESSED BY							

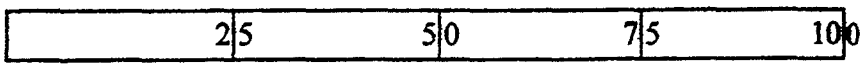
PERFORATIONS 2509-26

REMARKS: SEE NOTE BELOW.

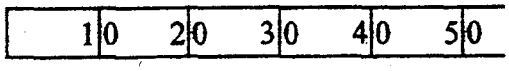
Exhibit "B-3"

B7


2400
INJECTION ZONES
PACKER
1
0:00
2450
0:45
2
Bottom of 4 1/2"
5 1/2" Casing
3
1:30
2500
4
2:15
100% Loss
5
6
3:00
3:51
LOW SENSITIVITY BASE LOG
2550
I.D. REACHED



PERCENT OF INPUT



PERCENT PER FOOT

GAMMA LOG

R/A FOLLOW UP TRACER

RADIO ACTIVITY INCREASES

PERFORATIONS FROM CUSTOMERS RECORDS

SLOTS

CHANNEL

WARREN AMERICAN OIL CO., LLC
CHAPMAN #B-7
N/A FIELD
OSAGE CO., OK.
10/2/2017

Sta. Num.	Rate Bbls. Day	Depth. Interval	Percent of Fluid Going Below Base of Interval	Percent of Fluid Lost in Interval	Press P.S.I.
1	1138	2414-2533	100	0	120
2	"	2533-2543	0	100	"
	NOTE:	SURVEY INDICATES FLUID LOSS BELOW REPORTED			
		PERFORATIONS @ 2533-2543. NO OTHER LEAKS OR			
		CHANNELS INDICATED.			

Comments submitted by
Kerry L. Sublette
Sarkeys Professor of Environmental Engineering
University of Tulsa
October 9, 2017

I have been asked to comment on certain assertions and findings referenced in the EPA Interim Final report titled "Bird Creek Investigation and Injection Well Response Action Plan" dated August 4, 2017. Each of these assertions or findings are given below followed by my comments.

Cation/anion analysis of injected fluids and high TDS waters show a match with the Mississippi Chat Formation (which is used for both oil production and an injection dispersal zone).

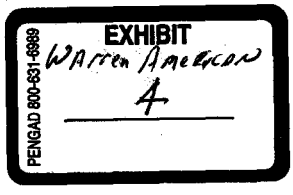
Stiff diagrams as visual representations of water composition are ambiguous when strongly dominated by one cation/anion pair such as Na^+ and Cl^-. Stiff diagrams can readily demonstrate that fresh water has been impacted with a produced water. It is much more difficult to demonstrate that fresh water has been impacted by a particular produced water. Definitive identification of a particular produced water requires analysis of minor components (As, Se, Cr, radioisotopes, etc) and/or isotopic analysis of $\delta^{18}O$, $\delta^{2}H$, and $^{87/86}Sr$. Isotopic analysis is the current state of the art for forensic analysis of produced water impacts. Thus with the available data it can concluded that the Bird Creek tributary was impacted by produced water but the source of that water remains unknown.

Surface water concentrations at the originally reported location (Monitoring Station 2, MS2) have declined steadily and significantly since the Jireh Resources Well 18 (OS6320) was repaired in September 2016 following an MIT failure.

Further declines at the original location (MS2) also occurred immediately after the shut-in of the Novy/Greyhorse disposal well (S5258) due to MIT failure.

High TDS remains at MS6, ½ mile downstream of the original location.

In the absence of significant turbulence introduction of saline waters into fresh water streams or rivers produces a stratified condition with the denser saline waters near the bottom and the fresh water above. If the depth of the stream is uniform the saline waters and the fresh water will flow more or less together in a stratified flow. If the stratified flow encounters a deep pool the denser saline waters will accumulated in the pools. Under ordinary flow conditions transport of salts out of the deeper layers of these pools occurs through diffusion and convective currents that operate near the boundary of the saline waters and fresh water in what can be considered a mixing or transition zone. Under normal flow conditions these mechanism will only slowly



transport salts downstream. Therefore, it has been observed that these stratified pools are often persistent over a long period of time. It is also well established that significant transport of salts out of a stratified pool requires turbulent mixing of the pools to scour saline waters out of the pool to mix with fresh water to be transported downstream. This type of turbulence results from significant rain events. The efficiency of any rain event to scour salts from the pools depends on the rain intensity, the depth of the pool and the geometry of the pool especially the slope of the downgradient wall of the pool. Following such an event it is not uncommon for salts transported downstream to collect in another pool and reform stratified layers of water based on density. Therefore, following large rain events significant fractions of the salts can be transported pool to pool. Cumulative rainfall is far less significant in determining salt transport from these pools.

Another consequence of the formation and persistence of these stratified pools is the formation of a temperature gradient where higher temperatures are measured in the dense saline layer at the bottom of the pool. Solar infrared radiation is absorbed by the bottom of the pool which heats the saline layer. The fresh water above acts as an insulator slowing the dissipation of the heat vertically. There are many examples of natural lakes of various depths, for example, with saline inputs that have resulted in stratified layers based on salt concentration and density where the dense saline layers are heated by the sun relative to the fresh water above.

Two pools in the tributary to Bird Creek were referenced extensively in the cited referenced interim final report, the pool at MS2 and the much deeper pool at MS6. The salinity and temperature data collected to date are consistent with a single release of produced water at or near MS2 in August 2016. All observations of increased or persistent salinity and elevated deep pool temperatures downstream of MS2 can be explained by stratified flow and pool to pool transport of salts as described above. Specifically the steady decline in bottom TDS in MS2 is consistent with the repeated scouring during significant rain events such as those shown below based on Foraker mesonet daily rainfall totals. Only rain events exceeding 1 inch are shown.

Date	**Rainfall (in)**
September 9, 2016	1.75
January 15, 2017	1.89
March 29, 2017	1.35
April 16, 2017	2.37
April 17, 2017	1.83
April 21, 2017	1.27
April 25. 2017	1.00
April 29, 2017	3.78
May 3, 2017	1.88
May 11, 2017	1.53
August 5, 2017	3.89
August 6, 2017	1.64
September 26, 2017	1.51

Given the expected behavior of stratified saline/fresh water pools during these types of rain events and the turbulence they would have created it is no surprise that the TDS in the pool at MS2 has decreased over this time period. Further the TDS in the pool at MS6 would be expected to increase and then decrease over the same time interval as has been observed. In the intervening periods between large rain events when rainfalls were low any salt-laden pools like that at MS6 would stratify and solar heating of the dense saline layer would be evident. In summary, with a reasonable degree of scientific certainty this is expected behavior consistent with a single discharge event in August 2016 at or near MS2. The TDS data alone cannot prove a cause-effect relationship between the TDS in the tributary and either the repair of the Jireh well in September 2016 or the shut in of the Novy/Greyhorse well on May 9, 2017 (note the large rain event two days later).

Monitoring at some locations indicates that despite repairs to the Jireh Well 18W (OS6320) and shut-in (termination) of the Novy/Grayhorse well, injection operations appeared to affect in-stream water quality (TDS) before and after the coordinated shut-in event, but amplitude (degree of variability) of short term concentration fluctuations at some stations diminished during the shut-in period. This indicates ongoing impacts from the injection operations unrelated to the mechanical integrity failures of these two wells.

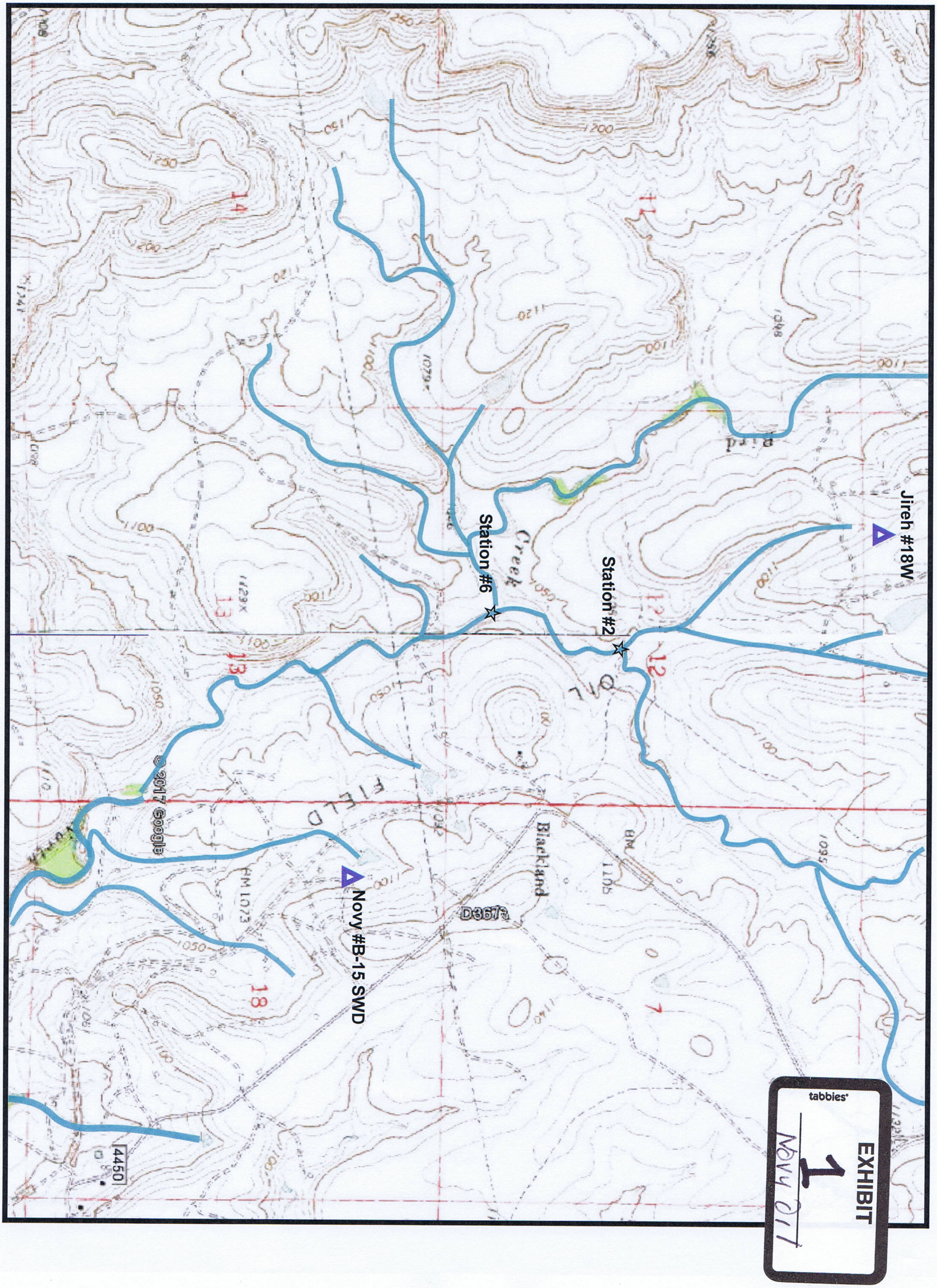
First of all, the expected pool-to-pool transport of salt in the stratified tributary and the depth of the pool at MS6 fully accounts for the appearance of salt contamination in the pool at MS6 and its long-term persistence as a dense, high-TDS layer in this deep pool. The much greater depth of this pool explains why this pool has not been as completely scoured as the more shallow pool at MS2.

The reference to variability in TDS seems to primarily refer to the difference in variability in TDS measurements at depth in the pool at MS6 prior to and after July 1, 2017. From the plot of TDS vs. time in the EPA report titled "In-Stream Monitoring Project at the Tributary of North Bird Creek Area" it appears that the increase in the amplitude of these variations followed removal of the sensor from the water (note TDS goes to zero) for cleaning, maintenance, or calibration. It is only after replacing the probe does the amplitude of these variations show a significant increase. The field technician could not be sure the sensor was replaced in the same spot. Most importantly the field technician could not be sure that the sensor was replaced at the same depth given the likely slope of the bottom of the pool. If the sensor was placed at a location higher in the dense saline layer closer to the transition zone between the dense saline layer and the fresh water above then the variability in the TDS could possibly be explained by the daily solar heating pattern. The TDS in the transition zone would be expected to be more sensitive to convective currents produced by heating during the day. In other words small variations in TDS were produced daily due to heat-induced differences in density and the resulting small-scale circulation of the water. At night, without solar heating some of these convective currents would be expected to relax.

In summary, the change in the amplitude of the TDS variations occurring immediately after the sensor was removed and replaced makes the cause of the change highly suspect. It is plausible that replacement of the sensor at a different vertical depth resulted in the change.

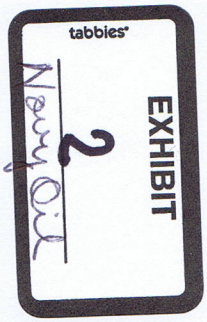
Recommendations

A major question that the above cited interim final report seeks to address is whether there is ongoing salt input to the Bird Creek tributary. The persistence of a high TDS saline layer in the pool at MS6 seems to be of most concern with regard to this question. As outlined above it is my opinion that all observations to date are consistent with a one-time event resulting in a large influx of produced water (and oil) into the tributary at or near MS2 in August 2016. However, there is a simple experiment that can be conducted to provide further evidence to support either position. The dense saline layer in the pool at MS6 could be pumped out for disposal allowing fresh water to return to the deeper regions of the pool. The TDS of the pool could then be monitored over time. If the TDS increases again then there is an ongoing input to the pool. In my opinion, the pumping and disposal process should be carried out in 2-3 stages. The removal process will result in some vertical mixing with some salt escaping removal in the first effort requiring a 2nd or 3rd trial (after re-stratifying) to fully remove the salt. Also given the age of the dense saline layer it is expected that salts will have diffused into the sediments. The time period between repeated withdrawals will allow the sediments to re-equilibrate with the water.

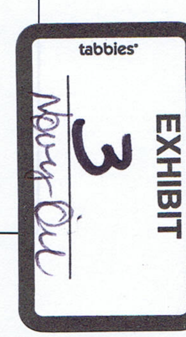


Station #6
Station #2
Jireh #18W
Novy #B-15 SWD
Bird
Creek
OIL
FIELD
Blackland
D3673
© 2017 Google
4450
tabbies
EXHIBIT
1


20
30
psi
10
MIKA
in.Hg
0
10
20
30


tabbies
EXHIBIT
2


Water Samples From Monitoring Station #2
TDS PPM
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
TDS
Jireh #18W Repair
R2=0.8651
6.06"
Max 5-Min
Rain Rate
Inches / Hr
Nowy #B-15 SI
R2=0.852
Cum Rainfall
25.71"
7/1/2016
8/20/2016
10/9/2016
11/28/2016
1/17/2017
3/8/2017
4/27/2017
6/16/2017
8/5/2017
9/24/2017
Date
0
10
20
30
40
50
60
70
80
90
Cum Rainfall (inches) - Foaker Mesonet Station


tabbies
EXHIBIT
3

MESONET RAINFALL RECORDS

FORAKER, OKLAHOMA

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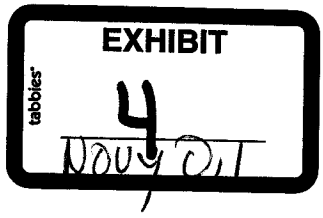
March 23, 2017 to August 1, 2017



2017	3	23	3/23/2017	FORA	0	0	18.89
2017	3	24	3/24/2017	FORA	0.12	0.06	18.95
2017	3	25	3/25/2017	FORA	0.12	0.03	18.98
2017	3	26	3/26/2017	FORA	0.84	0.56	19.54
2017	3	27	3/27/2017	FORA	0.48	0.11	19.65
2017	3	28	3/28/2017	FORA	1.2	0.56	20.21
2017	3	29	3/29/2017	FORA	1.08	1.35	21.56
2017	3	30	3/30/2017	FORA	0.12	0.03	21.59
2017	3	31	3/31/2017	FORA	0	0	21.59
2017	4	1	4/1/2017	FORA	0.12	0.07	21.66
2017	4	2	4/2/2017	FORA	0.48	0.46	22.12
2017	4	3	4/3/2017	FORA	1.32	0.58	22.7
2017	4	4	4/4/2017	FORA	1.2	0.31	23.01
2017	4	5	4/5/2017	FORA	0.36	0.1	23.11
2017	4	6	4/6/2017	FORA	0	0	23.11
2017	4	7	4/7/2017	FORA	0	0	23.11
2017	4	8	4/8/2017	FORA	0	0	23.11
2017	4	9	4/9/2017	FORA	0	0	23.11
2017	4	10	4/10/2017	FORA	0	0	23.11
2017	4	11	4/11/2017	FORA	0	0	23.11
2017	4	12	4/12/2017	FORA	0	0	23.11
2017	4	13	4/13/2017	FORA	1.2	0.58	23.69
2017	4	14	4/14/2017	FORA	0.12	0.02	23.71
2017	4	15	4/15/2017	FORA	0	0	23.71
2017	4	16	4/16/2017	FORA	5.88	2.37	26.08
2017	4	17	4/17/2017	FORA	2.88	1.83	27.91
2017	4	18	4/18/2017	FORA	0.12	0.01	27.92
2017	4	19	4/19/2017	FORA	0	0	27.92
2017	4	20	4/20/2017	FORA	0.24	0.08	28
2017	4	21	4/21/2017	FORA	0.6	1.27	29.27
2017	4	22	4/22/2017	FORA	0.12	0.02	29.29
2017	4	23	4/23/2017	FORA	0	0	29.29
2017	4	24	4/24/2017	FORA	0	0	29.29
2017	4	25	4/25/2017	FORA	2.88	1	30.29
2017	4	26	4/26/2017	FORA	0.12	0.04	30.33
2017	4	27	4/27/2017	FORA	-996	0.02	30.35
2017	4	28	4/28/2017	FORA	0.12	0.07	30.42
2017	4	29	4/29/2017	FORA	3.84	3.78	34.2
2017	4	30	4/30/2017	FORA	0.36	0.29	34.49
2017	5	1	5/1/2017	FORA	0	0	34.49
2017	5	2	5/2/2017	FORA	1.08	0.57	35.06
2017	5	3	5/3/2017	FORA	1.8	1.88	36.94
2017	5	4	5/4/2017	FORA	0	0	36.94
2017	5	5	5/5/2017	FORA	0	0	36.94
2017	5	6	5/6/2017	FORA	0	0	36.94
2017	5	7	5/7/2017	FORA	0	0	36.94
2017	5	8	5/8/2017	FORA	0	0	36.94

2017	5	9	5/9/2017 FORA	0	0	36.94
2017	5	10	5/10/2017 FORA	0.36	0.33	37.27
2017	5	11	5/11/2017 FORA	5.76	1.53	38.8
2017	5	12	5/12/2017 FORA	0.24	0.15	38.95
2017	5	13	5/13/2017 FORA	0	0	38.95
2017	5	14	5/14/2017 FORA	0	0	38.95
2017	5	15	5/15/2017 FORA	0	0	38.95
2017	5	16	5/16/2017 FORA	0	0	38.95
2017	5	17	5/17/2017 FORA	0.36	0.1	39.05
2017	5	18	5/18/2017 FORA	0.12	0.03	39.08
2017	5	19	5/19/2017 FORA	0.72	0.38	39.46
2017	5	20	5/20/2017 FORA	0.12	0.03	39.49
2017	5	21	5/21/2017 FORA	0	0	39.49
2017	5	22	5/22/2017 FORA	0.12	0.01	39.5
2017	5	23	5/23/2017 FORA	0	0	39.5
2017	5	24	5/24/2017 FORA	0	0	39.5
2017	5	25	5/25/2017 FORA	0	0	39.5
2017	5	26	5/26/2017 FORA	0	0	39.5
2017	5	27	5/27/2017 FORA	0	0	39.5
2017	5	28	5/28/2017 FORA	0.72	0.13	39.63
2017	5	29	5/29/2017 FORA	0	0	39.63
2017	5	30	5/30/2017 FORA	0.36	0.22	39.85
2017	5	31	5/31/2017 FORA	0	0	39.85
2017	6	1	6/1/2017 FORA	0	0	39.85
2017	6	2	6/2/2017 FORA	0	0	39.85
2017	6	3	6/3/2017 FORA	0.6	0.23	40.08
2017	6	4	6/4/2017 FORA	0.84	0.26	40.34
2017	6	5	6/5/2017 FORA	0	0	40.34
2017	6	6	6/6/2017 FORA	0	0	40.34
2017	6	7	6/7/2017 FORA	0	0	40.34
2017	6	8	6/8/2017 FORA	0	0	40.34
2017	6	9	6/9/2017 FORA	0	0	40.34
2017	6	10	6/10/2017 FORA	0	0	40.34
2017	6	11	6/11/2017 FORA	0	0	40.34
2017	6	12	6/12/2017 FORA	0	0	40.34
2017	6	13	6/13/2017 FORA	0	0	40.34
2017	6	14	6/14/2017 FORA	0	0	40.34
2017	6	15	6/15/2017 FORA	1.08	0.54	40.88
2017	6	16	6/16/2017 FORA	0	0	40.88
2017	6	17	6/17/2017 FORA	2.16	0.55	41.43
2017	6	18	6/18/2017 FORA	2.88	0.89	42.32
2017	6	19	6/19/2017 FORA	0	0	42.32
2017	6	20	6/20/2017 FORA	0	0	42.32
2017	6	21	6/21/2017 FORA	0	0	42.32
2017	6	22	6/22/2017 FORA	0	0	42.32
2017	6	23	6/23/2017 FORA	0	0	42.32
2017	6	24	6/24/2017 FORA	0	0	42.32

2017	6	25	6/25/2017	FORA	0	0	42.32
2017	6	26	6/26/2017	FORA	0	0	42.32
2017	6	27	6/27/2017	FORA	0	0	42.32
2017	6	28	6/28/2017	FORA	0	0	42.32
2017	6	29	6/29/2017	FORA	0	0	42.32
2017	6	30	6/30/2017	FORA	0.36	0.34	42.66
2017	7	1	7/1/2017	FORA	0	0	42.66
2017	7	2	7/2/2017	FORA	0.72	0.25	42.91
2017	7	3	7/3/2017	FORA	0.24	0.32	43.23
2017	7	4	7/4/2017	FORA	0.12	0.19	43.42
2017	7	5	7/5/2017	FORA	0	0	43.42
2017	7	6	7/6/2017	FORA	0	0	43.42
2017	7	7	7/7/2017	FORA	0	0	43.42
2017	7	8	7/8/2017	FORA	1.68	0.9	44.32
2017	7	9	7/9/2017	FORA	0	0	44.32
2017	7	10	7/10/2017	FORA	0	0	44.32
2017	7	11	7/11/2017	FORA	0	0	44.32
2017	7	12	7/12/2017	FORA	0	0	44.32
2017	7	13	7/13/2017	FORA	0	0	44.32
2017	7	14	7/14/2017	FORA	0.12	0.01	44.33
2017	7	15	7/15/2017	FORA	0	0	44.33
2017	7	16	7/16/2017	FORA	0	0	44.33
2017	7	17	7/17/2017	FORA	0	0	44.33
2017	7	18	7/18/2017	FORA	0	0	44.33
2017	7	19	7/19/2017	FORA	0	0	44.33
2017	7	20	7/20/2017	FORA	0	0	44.33
2017	7	21	7/21/2017	FORA	0	0	44.33
2017	7	22	7/22/2017	FORA	0	0	44.33
2017	7	23	7/23/2017	FORA	0	0	44.33
2017	7	24	7/24/2017	FORA	0	0	44.33
2017	7	25	7/25/2017	FORA	0	0	44.33
2017	7	26	7/26/2017	FORA	0.24	0.05	44.38
2017	7	27	7/27/2017	FORA	0.12	0.02	44.4
2017	7	28	7/28/2017	FORA	0	0	44.4
2017	7	29	7/29/2017	FORA	0	0	44.4
2017	7	30	7/30/2017	FORA	0	0	44.4
2017	7	31	7/31/2017	FORA	0	0	44.4
2017	8	1	8/1/2017	FORA	0.24	0.2	44.6